(2)

CONTRACT NO.: DAMD17-88-Z-8023

TITLE: EFFECT OF FOOD, DIET AND NUTRITION ON MILITARY READINESS AND PREPAREDNESS OF ARMY PERSONNEL AND DEPENDENTS IN A PEACETIME ENVIRONMENT

PRINCIPAL INVESTIGATOR: Donna H. Ryan

PI ADDRESS: Pennington Biomedical Research Center
6400 Perkins Road
Baton Rouge, Louisiana 70808

REPORT DATE: August 15, 1990

TYPE OF REPORT: Annual

PREPARED FOR: U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND
FORT DETRICK
FREDERICK, MARYLAND 21702-5012

DISTRIBUTION STATEMENT: Approved for public release;
distribution unlimited

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Pennington Biomedical Research Center 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) 6400 Perkins Road Baton Rouge, LA 70808-4124	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION U.S. Army Medical Research & Development Command 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER DAMD17-88-2-8023
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO
63002A	3M2-63002D819	AI	150

11. TITLE (Include Security Classification)
Effect of Food, Diet and nutrition on Military Readiness and Preparedness of Army Personnel and Dependents in a Peacetime Environment

12. PERSONAL AUTHOR(S)
Donna H. Ryan, M.D.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Annual	FROM 7/28/89 TO 7/28/90	August 15, 1990	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	RA 3, Nutrition, Health Promotion, Military Readiness, Nutritional status
06	01		
06	05		

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Five projects are underway at the Pennington Biomedical Research Center (PBRC). A clinical research laboratory is operational and supporting U.S. Army Research Institute of Environmental Medicine (USARIEM) field research in sites ranging from Alaska to Bolivia. A stable isotope laboratory supports USARIEM research by determining energy expenditure in the field. The Fort Polk Heart Smart Project has completed an assessment of nutritional and exercise habits of military wives. At Fort Polk, a project that evaluates screening for cardiovascular risk factors and a project that assesses a health promotion model in military families are underway. The Diet, Neurotransmitters and Behavior research team are conducting basic research in the effect of diet on behavior through biochemical, physiologic and behavioral assessment students. The Menu Modification Project has analyzed and altered Army menus and is performing sensory testing of the modifications prior to an analysis of project objectives.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Mary Frances Bostian	302-663-7325	SGRD-RMi-S

DD Form 1473, JUN 86 Previous editions are obsolete.

FOREWORD

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army. DTIC

Where copyrighted material is quoted, permission has been obtained to use such material.

Where material from documents designated for limited distribution is quoted, permission has been obtained to use the material.

Citations of commercial organizations and trade names in this report do not constitute an official Department of the Army endorsement or approval of the products or services of these organizations.

For the protection of human subjects, the investigator(s) have adhered to policies of applicable Federal Law 45CFR46. DTIC

In conducting research utilizing recombinant DNA technology, the investigator(s) adhered to current guidelines promulgated by the National Institutes of Health.

PI Signature: Donna H. Ryan Date: 8/15/90

TABLE OF CONTENTS

ANNUAL REPORT
US ARMY GRANT
AUGUST 1, 1989 - JULY 31, 1990

INTRODUCTION

In July, 1988, Grant #DAMD17-88-G-8023 was awarded to Pennington Biomedical Research Center (PBRC) for $3,500,000 for a three-year period to fulfill the following research objectives:

1) "Establish a Nutritional Health Promotion Research Development Test and Evaluation (RDTE) Center for military personnel and dependents in a peacetime environment to accomplish the following:

   a. Assess the nutritional adequacy of the diet of military personnel to promote health and military readiness;

   b. evaluate and develop military dietary programs for dining facilities, commissaries and other food service facilities operated by the military;

   c. monitor the nutritional status of military personnel and their family members; and

   d. develop and evaluate military nutrition, education, and health promotion programs.

2) Provide nutrition laboratory research support to the army's military nutrition research program at USARIEM to accomplish the following:

   a. provide biochemical assessment of nutrition status;

   b. perform food biochemistry analysis; and

   c. establish and perform stable isotope methodologies for nutritional assesssment."

Five projects whose scientific design has been approved by the United States Army are listed below.

1) Clinical Research Laboratory, Richard Tulley, Ph.D., Laboratory Manager,

2) Stable Isotope Laboratory, James DeLany, Ph.D., Laboratory Manager,

3) Diet, Neurotransmitters and Behavior, Chandan Prasad, Ph.D., Principal Investigator,

4) Cardiovascular Helth Promotion for Military Personnel and their Dependents-the Fort Polk Heart Smart Project-Principal Investigators, Gerald S. Berenson, M.D., and

David Harsha, Ph.D.,

5) US Army Menu Modification Project, Nena Cross, Ph.D., Principal Investigator.

Discussions of individual projects funded under this grant follow.

I. Clinical Research Laboratory

INTRODUCTION AND BACKGROUND

The Clinical Research Laboratory at Pennington Biomedical Research Center was established on June 1, 1989 with the appointment of Richard Tulley, Ph.D., as manager of the laboratory. The function of this laboratory is to "provide nutrition laboratory research support to the army's military nutrition research program at USARIEM to accomplish the following:

1. provide biochemical assessment of nutrition status;

2. perform food biochemistry analysis".

General Progress

We have achieved both of the above objectives. We are processing samples from USARIEM to evaluate nutrition status and have instrumentation in place to receive food samples for biochemistry analysis.

To date, the Clinical Research Laboratory has accomplished the following:

1. been equipped with general laboratory support equipment such as pH meter, analytical balances, refrigerated centrifuges, an air driven ultracentrifuge, refrigerators, freezers, water baths, microscopes, stirrer/hot plate, pipets, automated pipets, a freeze dryer, a sample digester, and general laboratory glassware;

2. been equipped with laboratory instrumentation including the Beckman Synchron CX5 automated clinical chemistry analyzer, the Coulter STKS hematology analyzer, the Hewlett Packard 1090M HPLC with autosampler, diode array and fluorescent detectors, the RIAstar 20 well gamma counter, the Perkin Elmer Z5100 Zeeman Graphite Furnace atomic absorption spectrophotometer, the Perkin Elmer P1000 ICP emission spectrophotometer, the Hewlett Packard UV-Vis diode array spectrophotometer, the Clinitek 2000 urine dip-stick reader, and the Antek Nitrogen analyzer;

3. received and accepted a bid of an instrument for catecholamine analysis by HPLC/electrochemical detection (Bio Rad Laboratories);

4. employed a student worker, Joe Zaweski, to aid the present workers, Kerrie Munson, MT (ASCP), and Richard Tulley, Ph.D., in work for the army studies.

5. did research and development work on methods for the analysis of ammonia, lactate, B-hydroxybutyrate, non esterified fatty acids, glycerol, general chemistry panel tests, HDL Cholesterol, amino acids, ferritin, B12/Folate, insulin, vasopressin, aldosterone, and RBC Folate.

6. set up and evaluated the Coulter STKS, the Antek Nitrogen Analyzer, and the Perkin Elmer P1000 ICP emission spectrophotometer.

7. performed analyses for USARIEM on the following studies: Carbohydrate Load Bearing Study, West Point Nutritional Assessment, and the Alaska Winter Field Feeding Evaluation.

8. received fecal samples from the Sodium Depletion Study for analysis of nitrogen, sodium, potassium, calcium, and magnesium.

Progress on Equipment

The Clinical Research Laboratory is equipped with the following instrumentation, purchased with funds other than those of this grant:

1. Beckman Synchron CX5 automated chemistry analyzer.

An automated chemistry analyzer capable of performing 28 colorimetric/UV analyses plus four electrolytes in a single run on serum, urine, or CSF samples. Computer controlled robotic sampling and mixing ensure precise pipetting and the precision of the analyses (1). Reagents for the colorimetric chemistries are held on-board in a refrigerated reagent compartment. The reagents are contained in three-compartment bar-coded cartridges. A cuvette wheel containing 80 cuvettes is recycled by continuous washing of the cuvettes (2). The detection is by a 13 wavelength photodiode array detector. Up to 200 different chemistries may be held in the computer's memory at one time. Reagents for the routine chemistries may be obtained pre-packaged from Beckman Instruments or user defined methods may be developed for other colorimetric chemistries (3). This analyzer has been favorably evaluated in the literature (4,5).
The tests which we are currently performing on the CX5 include the following:

glucose	albumin
urea	calcium
creatinine	phosphorus
sodium	magnesium
potassium	aspartate transaminase

chloride	alanine transaminase
carbon dioxide	alkaline phosphatase
uric acid	creatine kinase
total protein	lactate dehydrogenase
amylase	GGT
total bilirubin	direct bilirubin
cholesterol (total)	HDL cholesterol
triglyceride	iron
iron binding capacity	

User defined tests which we have developed include the following (6):

non esterified fatty acids
glycerol
beta hydroxybutyrate
lactic acid
ammonia

2. Coulter STKS hematology analyzer.

The Coulter STKS analyzer is a new hematology system which has combined the principle of cell counting by electronic impedance of the Coulter STKR (7) with the three dimensional cell differential counting capabilities of the Coulter VCS instrument (8). This instrument measures volume, conductivity, and light scatter of white blood cells to produce a three dimensional scattergram.

This analyzer produces the following:

red cell counts
white cell counts
platelet counts
hemoglobin
cell indices
hematocrit
five part white cell differential including lymphocytes, monocytes, basophils, neutrophils, and eosinophils.

3. Hewlett Packard 1090M HPLC with an autosampler and diode array and fluorescent detectors.

This instrument is capable of performing analyses on practically any substance which has been measured by HPLC using UV/colorimetric or fluorescence detection. We have to date set-up free amino acids in plasma using a modification of the OPA/FMOC precolumn derivatization method (9,10). We also plan to set-up analyses for vitamins A, E, B1 (thiamine),B2 (riboflavin) B6 (pyridoxine), and C.

4. Perkin Elmer Z5100 graphite furnace atomic absorption spectrometer.

This instrument is an atomic absorption spectrometer utilizing a graphite furnace with a stabilized temperature platform and Zeeman background correction (11,12).

We have lamps for the following elements:

copper
iron
chromium
potassium
manganese
calcium
zinc
sodium
selenium
magnesium
aluminum

5. Perkin Elmer P1000 inductively coupled plasma emission spectrometer.

This is a single monochromator ICP emission spectrometer capable of detecting emissions of elements within the full wavelength range UV to visible. The instrument allows for automated or manual background subtraction and the complete analysis can be totally automated. It is an improved version of the Plasma II ICP Emission Spectrometer (13). This instrument will be used for multielement profiles on samples as well as for single or multiple elements in the concentration ranges in which the graphite furnace will be too sensitive.

6. Clinitek 200 urine chemistry analyzer.

This is an automated urine chemistry strip reader. It is based on the principle of reflectance photometry. It is capable of performing the following tests:

glucose
ketones
blood
bilirubin
specific gravity
pH
protein
urobilinogen
nitrite
leukocytes

7. Antek Chemiluminescent Nitrogen Analyzer with autosampler.

Total urinary, fecal, or food nitrogen may be determined by chemiluminescence using our Model 703C Pyrochemiluminescent nitrogen system (Antek Instruments, Inc., Houston, TX 77076) equipped with an automatic sample injector, and a Spectra

Physics computing integrator. The instrument combusts the diluted sample (1:100) at 1100° C and converts any nitrogen to nitric oxide (NO). The NO reacts with ozone, produced by an on-board ozone generator, to form metastable nitrogen dioxide according to the reaction:

$$NO + O_3 \text{ ---> } NO_2*.$$

This molecule then decays to ground state NO_2 with the emission of light, which is measured by a photomultiplier tube in the instrument. The emission is proportional to the amount of nitrogen present in the sample (14). The method correlates well with the Kjeldahl method for total nitrogen content and has been found to be an effective and reliable monitor of nitrogen balance (15,16,17).

We have encountered certain difficulties in setting up this analyzer, specifically, with the autosampler. The program and hardware that were originally set-up by the company representative did not work and several weeks were spent in trying to correct the problems. It was determined that we had a bad interface cable, which was replaced, solving the hardware problem but not the software problem. A program that worked was finally obtained and the instrument now appears to be functional. We have found that because the metering of sample is done by positive air pressure that there is a limit to the number of replicates which can be performed from a sample vial. Since at least three samplings can usually be obtained (sometimes five) this should not be a problem. We will soon be performing actual evaluations of urinary and fecal nitrogen determinations.

8. Packard RIAstar Gamma Counter

This is a 20-well multi-well gamma counter allowing for the counting of 20 samples at one time. It can measure two channels simultaneously. It has computerized software to handle various types of curve fitting, worklists, and quality control. To date we have set-up the following assays using kits:

Serum Vitamin B12/Folic Acid (Bio Rad)
Red Cell Folic Acid (Bio Rad)
Ferritin (Bio Rad)
Aldosterone (Serono)
Arginine Vasopressin (INCSTAR)
insulin

We have plans on eventually performing the following hormone assays:
glucagon
cortisol
DHEA sulfate
others as needed

Progress on General Laboratory Quality Control

The Clinical Research Laboratory is currently involved in interlaboratory quality control monitoring for chemistry and hematology. In the next few months we plan to become part of CAP and/or other laboratory surveys for external laboratory quality control monitoring for chemistry, urinalysis, hematology, and immunoassay. In addition, we intend to apply for and receive lab accreditation by HCFA and CAP within the next year.

Other programs which have been instituted are the performance and logging of routine maintenance checks, temperature checks, reagent logging and verification, and pipet checks for accuracy and precision.

Progress on Methods Development

1. User Defined Chemistries on Beckman Synchron CX5

The first project initiated in the Clinical Research Laboratory at PBRC was the development of methods for the analysis of ammonia, lactate, glycerol, beta-hydroxybutyrate, and non esterified fatty acids on the Synchron CX5 analyzer. Each of these methods are now fully operational. The methods of reagent preparation for each test are listed in Table 1 below. Instrumental parameters for each test are given in Table 2. Studies for linearity, analytical recovery, precision, reagent stability, and calibration frequency have been performed and results are shown in Table 3 below.

Table 1. Preparation of Reagents for User Defined Chemistry (UDC) Tests on the Beckman Synchron CX5.

Test	Manufacturer	Dilute Rgt with/ (Compartmnt)	Dilute Enzyme Compartmnt C
AMMO	Sigma	9 ml H_2O/ (B)	70 ul + 700 ul 0.1M PO_4 buffer
GLOL	Sigma	29 ml H_2O/ (A)	100 ul + 1.7 ml H_2O
LACT	Sigma	working buffer= 4ml H_2O + 2ml buffer reconst NAD with 5ml working buffer/ (B)	100 ul + 1ml working buffer
NEFA	Wako	Reag A + 13 ml Dil A/ (A) Reag B + 5 ml Dil B/ (B)	None
BHBA	Sigma	9 ml H_2O/ (B)	200 ul + 800 ul H_2O

Table 2. Instrumental Conditions for UDC Analysis on the Beckman Synchron CX5.

Test	Rxn Dir	Smpl Vol, ul	1° Inj, ul	2° Inj, ul Add time	Blk Read, sec	Rxn Read, sec	Stds	1°/2° nm
AMMO	EP2 POS	25	200	20 624s	588-604	600-632	0 uM, 148 uM	340/380
GLOL	EP2 NEG	20	280	18 720s	680-712	688-720	101 uM 707 uM	340/380
LACT	EP2 POS	5	230/50	---	272-304	688-720	4.44mM	340/380
NEFA	EP2 POS	5	200	75 624s	572-604	600-632	0 mM 1.00mM	560/650
BHBA	EP2 POS	5	220/20	---	272-304	600-632	1.2 mM	340/380

Table 3. Analytical Results for UDC's Developed for the Beckman Synchron CX5.

Test	Linearity	Recovery	CV (level)	Reag Stab	Cal Freq
AMMO	0-300 uM	102.3%	5.0 % (174uM)	5 days	daily
GLOL	0-1300 uM	104.1%	2.8% (181 uM)	2 days	daily
LACT	0-5 mM	96.2%	1.6% (2.3 mM)	7+ days	weekly
NEFA	0-5 mM	101.1%	2.8% (1.8 mM)	7+ days	daily
BHBA	0-4.5 mM	101.9%	2.0% (1.1 mM)	7+ days	weekly

In all cases it was found that the stability of the reagents was maintained best by keeping the reagent components in separate compartments of the analytical reagent cartridges. They are not mixed until the actual time of the assay when they are combined within the reaction cuvette. It was also found that any test using a trigger reagent after taking a blank reading with sample and the first part of the reagent required a two point calibration. This is the case for glycerol (GLOL), ammonia (AMMO), and non esterified fatty acids (NEFA). Tests in which both parts of reagent are mixed prior to sample addition and are triggered by the addition of sample are beta hydroxybutyrate (BHBA), and lactate (LACT). These tests require only a single point calibration. Stability was also increased for the AMMO by making the enzyme dilution in 0.1 M phosphate buffer, pH 7.2.

Correlation studies have been performed for LACT and AMMO with the manual methods. The correlations are good. The scatter for AMMO is higher than one would like, but is believed to be due primarily to problems with reproducibility for the manual method. Correlation studies have recently been performed for LACT versus the Yellow Springs Inc. Lactate Analyzer, the manual method for glycerol, and the extraction method for non esterified fatty acids. This data is forthcoming.

2. Routine Chemistries on the Beckman Synchron CX5

Routine chemistries on the Beckman Synchron CX5 have been monitored by performing quality control on assayed and unassayed chemistry control material (Beckman Synchron Assayed Controls, 3 levels and Bio Rad Unassayed Controls). In addition, our results have been compared with other users in an interlaboratory QC program (Bio Rad Laboratories).

3. HDL Cholesterol

The heparin-Mn precipitation method (Bio Rad Laboratories) for HDL Cholesterol was evaluated. ? reagent is convenient in that it is a lyophilized reagent within self contained test tubes for each sample. No sample dilution occurs, therefore, no correction factors are necessary. However, it was found that results by this method were not compatible with the Synchron Cholesterol reagent. Results were far too high by these combined methods. Beckman technical representatives indicated that there are interferences with the heparin-Mn method and the buffer used in the Cholesterol reagent. For this reason, we elected to use the phosphotungstic acid method by DMA of Dallas, Texas. Results for this test have been reproducible and correlate well with another laboratory which uses phosphotungstic acid precipitation.

Results on interlaboratory comparison of HDL methods agree well with other methods such as heparin-Mn and dextran sulfate.

4. Coulter STKS

We have evaluated this method for reproducability and comparability using controls.

We are in the process of performing an evaluation of the accuracy and correlation of differentials performed by this instrument with manually performed differentials. This data will be forthcoming.

5. Amino Acids

The Hewlett Packard Amino Quant(R) method for the analysis of amino acids in protein hydrolysates uses o-phthalaldehyde (OPA) for the derivatization of primary amino acids and 9-fluorenylmethylchloroformate (FMOC) for the derivatization of secondary amino acids (proline and hydroxyproline) and separation on a reverse phase C-18 column (9).

The entire procedure is automated from derivatization to sample injection and detection wavelength programming. The method may be used with UV detection or fluorescent detection. We chose to use fluorescent detection for optimal sensitivity.
We found early on in our studies that the Amino Quant(R) method was inadequate for quantitation of amino acids in physiological

fluids because of the large number of amino acids and metabolites present. For this reason we undertook studies to develop the best solvent to achieve the best separation possible using the Amino Quant(R) column and derivatization procedure. The separation indeed proved to be very difficult, however, we found optimal conditions for separation of most of the amino acids found in physiological fluids. One serum sample was prepared by treatment with an equal volume of acetonitrile, centrifuging, and analyzing the supernatant. It appeared that minimal interferences were encountered. Solvent A used was 0.06M sodium acetate, pH 7.2, and Solvent B was composed of the mixture of acetonitrile/0.1 M sodium acetate/methanol (14:4:1). Instrument programming and chromatograms of 41 amino acid standards and calibration curves were performed.

More work needs to be done with this method. Still to be carried out are precision, linearity, and recovery studies. The optimal method of preparation of samples needs to be determined. This research is forthcoming.

6. Ferritin

   The Bio Rad IRMA kit for ferritin was evaluated. This kit was easy to perform and gave good results on the standard curve, reproducibility, and accuracy as determined by assayed controls.

7. Vitamin B_{12}/Folic Acid

   The Bio Rad dual label RIA for Vitamin B_{12}/Folate was set-up and evaluated and found acceptable.

8. RBC Folate

   RBC Folate was also determined using the Bio Rad RIA kit for Vitamin B_{12}/Folate after treatment of the samples with ascorbic acid and a folate diluent. Again, the results were good.

9. Insulin, Vasopressin, and Aldosterone

   These RIA procedures were set-up and evaluated in our laboratory with good results.

10. ICP Emission Spectrometer

    This instrument will be used for fecal and food sodium, potassium, calcium, and magnesium. These assays are yet to be developed.

Progress on Army Studies

The following studies have been completed for USARIEM:

1. Carbohydrate Load Study

A total of 51 samples were obtained and analyzed for ammonia, B-hydroxybutyrate, glucose, glycerol, lactate, non esterified fatty acids, and triglyceride. In addition, 180 samples were analyzed for plasma lactate. In total, 557 tests were performed. These results are reproduced in the appendix.

2. Alaska Winter Field Feeding Evaluation

T total of 156 samples were obtained for the analysis of Chemistry 22 panels plus HDL. In total, 3588 tests were performed.

3. West Point Nutritional Assessment Study

Approximately 400 samples were obtained for the analysis of serum lipids, iron, TIBC, ferritin, Vitamin B_{12}, and folic acid. Also, 94 samples were analyzed for red blood cell folic acid. In all, 1645 analyses were performed. The report is shown in the appendix.

4. Fecal Samples

Five large bags of human fecal samples have been received from the Sodium Depletion Study. These samples are being stored frozen until methods for total nitrogen, calcium, magnesium, sodium, and potassium are developed.

The total number of tests performed thus far for USARIEM is 5790.

References

1. Smith K, Cheng, S, Ray, E, Villa B, Haden B. Estimates of precision of endpoint chemistries on the Beckman Synchron Cx4/Cx5 clinical system. Clin Chem 1988; 34:1168.

2. Flores, D. Protocol for determination of cuvette washer efficiency in automated chemistry analyzers as applied to the Beckman Synchron Cx4. Clin Chem 1988; 34: 1168-1169.

3. Ishii S, Day K, Newton M, Hall R. evaluation of user defined reagents on the Beckman Synchron Cx4 and Cx5 clinical systems. Clin Chem 1989; 35: 1097.

4. Kubasik NP, Cordy P, Jonza J, Mayer T, D'Souza J. Evaluation of the Beckman Synchron Cx5 analyzer. Clin Chem 1989; 35:1108-1109.

5. Millsap S, Powers M, Noriyuki I, Ilano V, Aberin C. A clinical evaluation of the Beckman Synchron Cx5 chemistry analyzer. Clin Chem 1989; 35: 1103.

6. Tulley, R. Unpublished results.

7. Coulter STKR Hematology System. The Instrument Report, Volume 1, Number 7. Applied Technology Associates, Inc. 1989.

8. Multidimensional leukocyte differential analysis. Coulter Hematology Analyzer, Volume 11, No.1, Coulter Electronics, Inc., 1989.

9. Schuster R. Determination of amino acids in biological, pharmaceutical, plant and food samples by automated precolumn derivatization and high-performance liquid chromatography. J Chromatography 1988; 431: 271-284.

10. Tulley R, Munson KR. Unpublished results.

11. Fernandez, FJ, Beaty, MM, Barnett WB. Correction for high background levels using the zeeman effect. Atomic Spectroscopy 1981; 2:73-80.

12. Slavin W, Carnrick GR, Manning DC, Pruszkowska. Recent experiences with the stabilized temperature platform furnace and zeeman background correction. Atomic Spectroscopy 1983; 4: 69-86.

13. Ediger RD, Yates DA, Pruszkowska E, Collins JB, Vollmer JW. An integrated approach to icp spectroscopy. Atomic Absorption 1985; 6:56-59.

14. Pyrochemiluminescent nitrogen system: total urinary nitrogen procedure for in vitro diagnostic use. Antek Application Note No. 121, Antek Instruments, Inc., Houston, TX 77076 (1987).

15. Konstantinides FN, Boehm KA, Radmer WJ, Storm MC, Adderly JT, Weisdorf SA, and Cerra FB, Pyrochemiluminescence: real-time, cost-effective method for determining total urinary nitrogen in clinical nitrogen-balance studies. Clin Chem 1988; 34:2518-2520.

16. Grimble GK, West MFE, Acuti ABC, Rees RG, Hunjan MK, Webster JD, Frost PG, and Silk DBA, Assessment of an automated chemiluminescence nitrogen analyzer for routine use in clinical nutrition. J Parenteral Enteral Nutr 1988; 12:100-106.

17. Skogerboe KJ, Labbe RF, Rettmer RL, Sundquist JP, and Gargett AM, Chemiluminescent measurement of total urinary nitrogen for accurate calculation of nitrogen balance. Clin Chem 1990;36:752-755.

II. Stable Isotope Laboratory

INTRODUCTION

Establishment of a Stable Isotope Laboratory to support the Army's military nutrition research program at USARIEM is a research objective of US Army grant DAMD 17-88-G-8023. The Stable Isotope Laboratory at Pennington Biomedical Research Center was established in September, 1989 with the employment of James P. DeLany, Ph.D., as manager of the laboratory. The laboratory is established and

processing samples to support USARIEM with stable isotope methodologies for nutritional assessment.

PROGRESS

A Finnigan Delta S Isotope Ratio Mass Spectrometer, a water-CO_2 equilibrator, a Breath Carousel for CO_2 Analysis, a Gas Chromatograph/Combustion Interface and a Multiport automatic tube cracker were purchased using USDA funds and have been installed and calibrated. Two water samples have been analyzed for deuterium enrichment after reduction of water to hydrogen gas over zinc at 500 °C. The water samples have been analyzed repeatedly over several days and very good external precision has been obtained: baseline sample (n=23) -31.2±0.96 o/oo$_{SMOW}$ and enriched sample (n=14) 437.8±1.84 o/oo$_{SMOW}$. A water sample has also been analyzed for ^{18}O using a CO_2/water equilibrator and good precision has been obtained (n=24) 25.94±0.11 o/oo.

Dr. DeLany is presently involved in two studies in conjunction with military nutrition personnel at USARIEM. Dr. DeLany has collaborated with CPT Robert J. Moore, Ph.D., Research Biochemist, on the Alaska90 Cold Weather Study. Dr. DeLany has also collaborated with Reed Hoyt, Ph.D., Research Physiologist with the Altitude Research Division on the Bolivia High altitude study.

ALASKA90

Energy expenditure of soldiers during their cold weather exercise will be determined using the doubly labeled water technique. Six subjects who did not receive the heavy water were examined to correct for any baseline isotopic shifts in the labeled group. There were initially 15 labeled subjects but one subject dropped out of the study (#109).

The deuterium and ^{18}O enrichment of 6 urine samples between February 4, and February 14 have been analyzed in the six unlabeled subjects of the Alaska90 Study. The results are presented below. It is encouraging to note that the deuterium and ^{18}O enrichments changed concomitantly in most subjects.

Baseline Isotope Shift of Unlabeled Group

	Subject #						
	102	114	117	119	121	122	MEAN
	DEUTERIUM, del o/oo$_{SMOW}$						
04-Feb-90	-131.5	-106.4	-103.7	-97.6	-104.1		-108.7
05-Feb-90	-133.6	-105.1	-103.4	-98.8	-106.0	-115.2	-110.3
07-Feb-90	-130.1	-101.1				-117.1	-116.1
08-Feb-90	-129.9	-113.0	-110.6	-100.5	-108.1	-115.0	-112.9
12-Feb-90		-119.6	-107.1	-101.3	-113.4	-99.0	-108.1
13-Feb-90	-135.0		-94.8	-106.6	-114.2	-115.6	-113.2
14-Feb-90	-127.1	-112.0	-102.2	-98.8	-115.0	-108.2	-110.6

	O-18 , del o/oo SMOW						
04-Feb-90	-10.49	-8.94	-8.87	-8.06	-9.22		-9.12
05-Feb-90	-10.33	-8.78	-8.65	-7.90	-9.18	-9.47	-9.05
07-Feb-90	-10.08	-8.49				-9.22	-9.26
08-Feb-90	-9.61	-9.99	-9.26	-7.74	-8.95	-9.05	-9.10
12-Feb-90		-10.69	-8.65	-7.54	-9.16	-6.81	-8.57
13-Feb-90	-10.72		-7.46	-8.33	-9.42	-8.91	-8.97
14-Feb-90	-9.54	-9.37	-7.60	-7.12	-7.89	-7.37	-8.15

The ^{18}O enrichment of 6 urine samples and 6 saliva samples for have been analyzed in the 14 labeled subjects. The ^{18}O elimination rates were calculated by the two point method, using the initial and final enrichments, as well as a regression method (5 time points). The analyses for one subject (#104) were repeated to determine the analytical precision. Some equipment problems occurred during the analyses of the samples for #116. The samples were analyzed twice, but the precision of these analyses is not typical. The ^{18}O enrichments have also been determined for the initial and final time points for use in calculating isotope dilution spaces and body composition. The dosing schedule is needed to calculate these items. The isotope abundance shifts from the placebo group were used to correct the isotope enrichment data for the labeled subjects. The results are presented below.

Subject #	^{18}O Elimination rates		^{18}O Enrichments	
	2-point	Regression	Initial	Final
101	0.1189	0.1199	123.96	43.01
104	0.1017	0.1050	118.69	44.15
104Repeat	0.1021	0.1058	118.18	44.11
105	0.0958	0.0974	124.94	48.23
106	0.0975	0.0987	116.40	42.65
107	0.1144	0.1144	138.69	48.15
108	0.0975	0.0989	110.45	41.28
110	0.1194	0.1212	121.66	44.04
111	0.1076	0.1076	125.62	47.91
112	0.0976	0.0971	126.46	43.95
113	0.1069	0.1095	118.55	44.74
116a	0.1035	0.1113	105.29	37.04
116b	0.1056	0.1137	103.92	37.16
118	0.1100	0.1129	119.89	42.53
123	0.0981	0.0997	108.53	39.97
124	0.1213	0.1225	115.96	42.95

The coefficient of variation for the elimination rate by the 2-pt method was 0.4% while for regression it was 0.8%. The CV for the dilution space was 0.4% and 0.1% for the initial and final time points. The elimination rates calculated by the 2 point method and the regression method were similar in some instances but considerably different in others.

The deuterium analyses are underway. Energy expenditure and

body composition will then be calculated for the 14 labeled soldiers.

BOLIVIA HIGH ALTITUDE STUDY

The protocol for the Bolivia High Altitude Study was completed in collaboration with Dr. Reed Hoyt. The study has been completed and the samples will arrive in August, 1990.

III. Diet, Neurotransmitters and Behavior

A state of the art multidisciplinary approach drawing personnel from different specialities has been established. The scientific staff includes, Jeff Brock, PhD, Shakeel Farooqui, PhD, Anwar Hamdii, MD,PhD, Emmanuel Onaivi, PhD and Masahiro Sakota, MD, under the direction of Chandan Prasad, Ph.D.

A number of student workers have also been added: Joseph LaFleur, Stephanie Talton, Lisa Theriot, Sheela Venugapal, and Shorye Payne.

BACKGROUND

The neuroscience research program focuses on basic and applied research, utilizing a number of techniques in molecular biology, neurochemistry, pharmacology, and neurophysiology. The summary of the basic and applied research, and the application are presented.

1) Applied Research

* Diet, brain chemistry, and behavior
* Nutritional factors in drug abuse
* Higher brain function (cognition and dendritic spine densities)

2) Basic Research

A) * Regulation of dopaminergic neurons
* Neurochemistry
* Molecular biology

B) * Dietary peptides and neuronal function

Application

* Mental performance, function, and dysfunction,
* Aging and development,
* Neurological and mental disorders eg., Parkinsonism and schizophrenia

General progress:

The significant results summarized below have generated a number of publicaitons and presentations at scientific meetings. The areas of major progress include:

1. Behavioral Neurochemistry of Food-derived Peptides:

We have chosen three peptides to be included under this program: i) cyclo(His-Pro), CHP, ii) casein-derived peptides (exorphins), and iii) delta-sleep inducing peptide, DSIP (a peptide known to reduce blood pressure and protect against stress response). The first phase of this study has largely concentrated on i) The relationship between diet and endogenous cyclo (His-Pro) levels, and ii) the mechanism of action of cyclo (His-Pro) in the striatum, an area of the brain actively involved in motor coordination.

CHP has been shown to exist in a variety of tissues and biological fluids such as the brain, GI tract, blood, CSF, and semen, etc. While CHP-like immunoreactivity from such biological specimens has been characterized chromatographically, in no case has the peptide been isolated in enough quantity and purity that its presence can be ascertained by physical methods. We for the first time, have isolated pure CHP from human urine and determined its structure to be histidyl-proline diketopiperazine. These data have been accepted for publication in "Biochemistry International".

Having established the existence of CHP in a biological fluid, we have focused our attention on the question "could dietary proteins serve as cyclo (His-Pro) precursors?". To this end, we have examined the urinary levels of CHP in three species- a carnivore (leopard), an herbivore (rhinoceros), and an omnivore (man). The data from these studies suggest that urinary levels of CHP is higher in animals consuming high levels of dietary proteins. However, in these studies data on exact composition of diet at dietary levels CHP was not available. Therefore, we subjected rats to three different diets (of known chemical composition with undetectable level of CHP): carbohydrate-rich, casein-rich, and whey-rich.

Proteins in casein and whey have 13 and 3 Pro-His or His-Pro sequences. If both of these proteins were to be hydrolyzed in such a way to release all His-Pro of Pro-His sequences, animals on casein-diet should excrete at least 4 times more CHP than those on whey diet. This hypothesis is also consistent with the observation that exogenous CHP rapidly clears from the plasma and accumulates in the urine. However, the results from this study show that the differences in the plasma or urine levels of CHP in rats on these three different diets (carbohydrate, casein, and whey) were insignificant.

In conclusion, it appears that endogenous CHP may not be derived from the metabolism of ingested dietary proteins.

In a related study, we have examined the presence of CHP in 12 common nutritional supplements using partial protein hydrolysates. Nine out of 12 samples contained CHP. Those supplements with the highest CHP levels had undergone more intense thermal manipulation prior to packaging than others. Furthermore, oral administraiton of one of these supplements (Ensure) to a human volunteer resulted in a rapid rise in plasma levels of CHP.

In conclusion, these data show that while it is unlikely that CHP may be derived from dietary proteins, a diet containing hydrolysed protein (or CHP) may contribute to endogenous levels of CHP.

2. Preparation Characterization and Application of D_2 Dopamine Receptor Antibodies:

Dopamine plays an important key role in brain function. The abnormalities in the metabolism of dopamine in specific regions of the brain lead to mental and neurological disorders , which are characterized in schizophrenia and Parkinson's disease. In order to study these molecular disturbances we raised antibodies against the dopamine receptor type D_2 in rabbits. Two peptides corresponding to amino acid sequence predicted from the nucleotide sequence of the dopamine D_2 receptor were chemicaly synthesized. Peptide 1 (CGSEGKADRPHYC) and Peptide 2 (NNTDQNECIIY) correspond to 24-36 and 86-98 from the NH2 terminal. The peptides were conjugated with a keyhole limpet hemocyanin using glutraldehyde and the conjugate was injected into rabbits. The polyclonal antiserum was obtained and screened for specific antipeptide 1 or antipeptide 2 antibodies on ELISA. Antibodies against peptide 1 showed high titer for peptide 1 with little or no cross reactivity with the other peptides. The antibodies were further characterized on a Western blot. Peptide 1 antibodies reacted with denatured D_2 receptors from rat striatal membranes, Mr 91 kDa. The preimmune sera or peptide 2 antibodies did not show any band corresponding to 91 kDa. Peptide 1 antibodies were further characterized for immunoinhibition studies using D_2 specific ligands. Peptide 1 antibodies significantly (40%) inhibit the photoaffinity labeling of D_2 receptor by 125I-NAPS. Such an interaction of antibody with native D_2 receptor was further studied using a D_2 specific ligand (3H) YM-09151-2. (3H) YM-09151-2 binding was significantly inhibited (35-40%) by the addition of peptide 1 antibodies. The addition of preimmune or pooled rabbit serum did not show an inhibition in the Ym binding. These results suggest the presence of anti D_2 receptor antibodies which bind to dopamine receptor either on the ligand binding site or in close proximity, which results in the inhibition of ligand receptor interaction.

3. Diet, Neurotransmitters and Behavior:

A number of project designed to investigate the performance of rodents in a battery of behavioral and biochemical tests were initiated. In the first phase of these experiments groups of rats were subjected to equicaloric diet containing normal (20%), low (8%) and high (50%) casein for 20 weeks.

NEUROCHEMICAL ANALYSES

In the different groups the effect of the different dietary alterations on catecholamine and indolamine and their metabolites in at least 36 rat brain nuclei was determined. Using the punch dissecting procedure of Palkovits(1973) the different nuclei were

obtained and prepared for neurochemistry. The HPLC with Colormetric detection was utilized in the determinations. This study when completed and analyzed represents a most comprehensive analysis of the effect of dietary macronutrient (protein and carbohydrate) manipulation on neurotransmitter distribution in the rat brain. Previous studies have analyzed limited brain areas with conflicting data of increase, decrease or no change in neurotransmitter and metabolite distributions.

BEHAVIORAL ANALYSES

In assessing the performance of rats in the battery of behavioral test systems, the animals on the high protein diet were more responsive in sensorimotor function, negative geotaxis and spontaneous locomotor activities when compared to normal and the low protein groups. These rats showed a reduced aversion in the elevated plu - maze test which has been extensively used to study anxiolytics and anxiogenic drugs. In the tail flick reaction time to a heat stimulus, analgesia was produced in animals fed the low protein diet while hyperalgesia was induced in animals on the high protein diet. It was concluded that the high - protein diet may modulate not only the central dopaminergic function but also the benzodiazepine supra molecular complex and nociceptive processing systems.

DIETARY PROTEIN AND PREPARATORY AROUSAL IN RATS.

Previous investigators have observed that rats fed high-protein diets (50-80% casein) are easily frightened and demonstrate more violent behavior than rats on contr[illegible] diets. Data from our laboratory has shown that rats fed a chronic, high protein diet (50% casein) are more reactive to nociceptive stimuli than those fed either normal or low protein diets (20 and 8% casein respectively). The mechanisms underlying these changes are unknown. However, it is known that high-protein diets cause an increase in the excetion of calcium and magnesium. In humans, hypomagnesemia causes irritability, disorientation, and neuroses.

Hyper-responsiveness to stimuli, fear and combativeness are expressions of two very similar behavioral subroutine, known as the Alerting Reaction and the Defense Reaction. It is well known that the cerebral component of the alerting reaction involves the processing of auditory, visual and somatosensory information. In both humans and animals, the frontal cortex participates in preparatory arousal in response to stimuli. The cerebral cortex activates or inhibits specific motor subroutines, such as the defense reaction, in accordance to the demands of the stimuli. Electrical activity recorded from the cerebral cortex (EEG) always reflects the subject's general state of alertness. The degree of a subject's arousal or attention is more markedly expressed in the magnitude of the negative shift in the EEG recording when the subject is presented with an alerting stimulus. In humans, this is called the Contingent Negative Variation (CNV). Rats demonstrate cortical negativity responses that are similar to the CNV in humans

and they are measurable even under urethane/chloralose anesthesia.

In humans, low-amplitude and prolonged CNVs are associated with conditions of schizophrenia, depression and injury-related dementias. High-amplitude CNVs are seen in neurotic patients and in cases of psychosomatic illness, such as asthma. Normally,the frontal component of the CNV can be conditioned with training. It is interesting and relevant that hyperactive subjects present with a short-latency, but rapidly deteriorating, frontal component in their CNVs. It has been suggested that these individuals suffer from an attention deficit, perhaps due to an impaired communication between the frontal cortex and thalamus. The present study is based upon the concept that the rats which are fed a chronic, high protein diet develop a deficit in information processing in the frontal cortex which resembles a condition of hyperactivity in humans, as an explanation for their abnormal psychomotor behavior.

Recording cortical negativity responses is a method of investigating the effects of diet on behavior at the neurophysiological level. This study will yield valuable data even if the cortical negativity responses in the high protein group are not different from controls. Such data would suggest that the high-protein diet causes changes in a more discrete area of the brain than otherwise is expected. Also, the observation would direct future studies to look for a more subthalamic circuit as mediating the behavioral effects of high-protein diets.

Thirty rats were purchased from commercial breeders. They were housed in separate cages and labelled as 3 groups (10 per group). One group is being fed a high-protein diet (50% casein), one group is being fed a normal-protein diet (18% casein), and the third group will be fed a low-protein diet (8% casein). All animals will be on their respective diets for at least 120 days, then each will be prepared for terminal experimentation. All animals will be acutely anesthetized with a combination of urethane and alpha-chloralose (780 and 50 mg/kg, i.p., respectively). Surgery will be performed for the placement of an endotracheal tube and an intra-arterial catheter for monitoring heart rate and blood pressure. The frontal cortex will be exposed for direct recording of the electroencephalogram. The negative shift in slow potentials will be recorded in response to electrical stimulation of the tail. At the end of all experiments, animals will be sacrificed by an overdose of euthanasia solution.

LEVELS OF PROTEIN IN DIET AND MODIFICATION OF BEHAVIORAL RESPONSES TO CNS ACTING DRUGS.

An elaborate study was undertaken to determine the effects of long term dietary protein manipulation on the behavioral effects of some centrally acting drugs. In this study, mice were used and placed on one of the three equicaloric diets for 35 weeks: High Protein (HP), Medium Protein (MP), Low Protein (LP). The diets consisted of 50, 20, and 8% caesin, respectively. The rest of the calories in the diet were made up with constarch and sucrose. All

three diets were supplemented with a salt and vitamin mixture and choline bitartrate. At the end of the treatment period, the final weight was not significantly different in the three groups. Locomotor activity and stereotypy following the administration of the vehichle or amphetamine (0.1 and 1.0 mg/ml) was measured using the opto-varimex mini system obtained from Columbus Instruments and data was analyzed using one-way ANOVA followed by Dunnett's t-test.

Both spontaneous locomotion and stereotypy increased as the level of protein in the diet increased ($p<0.05$, N=6 per group).

The MP fed animals exhibited a slight decrease in locomotion at low amphetamine but significantly increased at the higher dose of amphetamine. In contrast, LP animals showed significant increase in locomotion at both amphetamine doses.

The stereotypic response after amphetamine in the LP or MP animals exhibited similar pattern as the locomotor activity.

These results suggest that central dopamine receptors were altered by the long-term dietary protein manipulation and consequently modified the amphetamine induced behavior.

THE EFFECTS OF FLUPHENAZINE AND DELTA-NINE-THC ON THE BEHAVIOR OF MICE FED DIFFERENT PROTEIN DIETS

The next series of experiments were designed to further assess the influence of the long-term dietary protein manipulation and the consequences on the behavioral performance following the administration of a neuroleptic, fluphenazine, and the psychoactive constituent of marijuana, delta-9-THC. In this experiment male ICR mice weighing 20-25 grams were housed in a temperature controlled room with reversed 12:12 hr light/dark cycle. The animals in the following groups were fed equicaloric diets, A: Low Protein, B: High Protein, and C: Mixed meal for 35 weeks.

Injection procedure: Animals in the different groups were injected intraperitoneally (ip) with the vehicle, delta-9-THC, or fluphenazine.

The performance of the animals in a number of behavioral test systems was evaluated following the administration of the vehicle or drug regimen: fluphenazine (0.01-0.5 mg/kg), delta-9-THC (1-30 mg/kg). The vehicle or drug were administered for 40 minutes prior to behavioral analysis.

Behavioral Assessment

Spontaneous Locomotor Activity: The spontaneous locomotor activity of mice was monitored in individual activity cages following vehicle or drug treatment. The computer-controlled system is designed to monitor the total as well as ambulatory counts. The stereotype response was deduced from the difference between the total and ambulatory counts.

The dietary protein manipulation modulated mouse motor behavior with the spontaneous locomotor activity of the animals on the high protein diet increased by about 50% ($p<0.05$).

In naive animals delta-9-THC or fluphenazine produced a dose dependent inhibition of mouse spontaneous locomotor activity. The high-protein diet increased the mouse sensitivity to the locomotor inhibitory effects of fluphenazine or delta-9-THC.

Catalepsy: The Pertwee ring test was utilized to assess catalepsy and data expressed as an immobility index. All animal were assessed for a total of five minutes and the time each animal remained motionless on the ring was recorded.

In naive mice, fluphenazine or delta-nine THC induced a dose dependent state of immobility. It was observed that the dietary protein manipulation modified the catalepsy induced by fluphenazine or delta-9-THC. The high protein diet influenced the cataleptogenic sensitivity to fluphenazine or delta-9-THC as compared to the low or medium protein fed animals.

Tail-flick: The tailflick reaction time to a heat stimulus was determined after vehicle or delta-9-THC administration. A ten second maximum latency was set to prevent tissue damage. The change in latency for each animal was computed and expressed as % MPE (% possible effect) where % MPE was determined using the following method: {(test latency-control latency)/ (10 seconds-control latency)} x 100.

The long term high protein dietary manipulation increased the mouse sensitivity to the effects of delta-nine-THC.

Stress and Anxiety Index: The computer controlled two compartment black and white box, as well as the elevated plus maze were used to determine the stress/anxiety index following different diets. The exploratory activity in the black and white chambers as well as the number of transitions were recorded in a 5 minute test session.

The feeding of the high and low protein diets reduced and increased mouse aversion in the test known to be sensitive to anti-anxiety drugs.

Fluphenazine, a dopamine antagonist, induced catalepsy, inhibited stereotypy, and reduced mouse spontaneous locomotor activities. A similar pattern was recorded with delta-9-THC where modified by the dietary protein manipulation.

The results taken together suggest that CNS function can be influenced by long term dietary protein alteration, and diet may modify those receptors that are sensitive to the effects of delta-9-THC. Furthermore, the central dopamine receptor function may be altered by the dietary protein manipulation. It is unlikely that the mechanism of action underlying the behavioral modification

induced by delta-9-THC or fluphenazine following the dietary manipulation are the same.

Reprints and abstracts (see appendix)

1. Prasad C, Ragan FA, Hilton CW: Isolation of CYCLO(HIS-PRO)-like immunoreactivity from human urine and demonstration of its immunologic, pharmacologic, and physico-chemical identity with the synthetic peptide. Biochemistry international (in press).

2. Prasad C and Spahn SA: One-year continuous low-dose Nicotine intake does not alter body weight of rats. Int. j. Vit., Nutr. Res. 59: 413-416, 1989

3. Farooqui SM, Brock JW, Hamdi A and Prasad C: Synthetic peptides predicted from the amino acid sequence of D2 dopamine receptor exhibit antibodies reactive with native dopamine receptor protein in rat brain. Prepared manuscript. (not included in appendix)

4. Onaivi ES, Brock JW and Prasad C: High-Protein diet modulates dopamine-and non-dopamine mediated behaviors. Prepared manuscript. (not included in appendix)

5. Onaivi ES, Brock JW, Hamdi A and Prasad C: High-protein diet modulates dopamine and non-dopamine mediated behaviors in rats. To be presented at the Society for Neuroscience meeting, 1990.

6. Brock JW, Farooqui SM and Prasad C: Dopamine type D2 receptor-specific antibodies. To be presented at the Society for Neuroscience meeting, 1990.

7. Chuang CZ, Ragan FA and Prasad C: Optimization of conditions for seperation of ten tryptophan metabolites by RP-HPLC. To be presented at the Society for Neuroscience meeting, 1990.

8. Prasad C: Cyclic dipeptides and neuronal function. To be presented at the symposium on Endocrine and Nutritional control of basic biological functions, 1990.

9. Onaivi ES, Talton S and Prasad C: Level of protein in diet modulates the behavioral effects of amphetamine. To be presented at the symposium on Endocrine and Nutritional control of basic biological functions, 1990.

10. Hilton CW, Prasad C and Reddy S: Identification of a potentially bioactive peptide, [CYCL(HIS-PRO)], in some nutritional supplements. A Clinical research abstract, 1990.

11. Hilton CW, Prasad C and Wilber JF: Acute alterations of CYCL(HIS-PRO) levels after oral ingestion of glucose. Neuropeptides, 15:55-59, 1990.

12. Ikegami H, Spahn SA and Prasad C: Effect of chronic nicotine consumption on body weight, food intake, and striatal dopaminergic

neurons in rats. Nutrition Research, 9: 635-643, 1990

13. Ikegami H and Prasad C: Neuropeptide-dopamine interactions. V. CYCL(HIS-PRO) regulation of striatal dopamine transporter complex. Peptides, 11: 145-148, 1990.

14. Chuang CZ, Ragan FA and Prasad C: Optimization of conditions for the simultaneous seperation of ten tryptophan metabolites using reversed - phase high - performance liquid chromatography. J. Chromatography. Biomedical Applications (In press).

IV. Fort Polk Heart Smart Project

Introduction and Background

Initiated in December, 1988, the Fort Polk Heart Smart Project is an effort aimed at evaluating and addressing cardiovascular (CV) and nutritional health status in military families. During the past two decades considerable advances have been made to improve health promotion for children and young adults with marked potential for decreasing CV risk later in life.

Cardiovascular disease is a major cause of death in the United States and in Western industrialized countries, e.g., Great Britain, West Germany, and Russia. Despite the slight decrease in prevalence of CV diseases that has occurred over the past two decades, heart disease is still the major killer in the U.S. population. Approximately one and one/half million individuals have a myocardial infarction annually, and two to three hundred thousand cases of sudden death occur each year due to coronary artery disease. The two major adult CV diseases that account for such cardiac events are coronary atherosclerosis and essential hypertension. Coronary artery disease in general is more prevalent in young white men, while primary hypertension is more prevalent in blacks.

The morbid events due to atherosclerosis and hypertension include congestive heart failure, cerebrovascular accidents, myocardial infarction, and sudden death. The concept of CV risk factor profiles generated from the Framingham Study and other adult epidemiology programs has helped considerably in identifying individuals with a high probability of being at risk for these CV disease events.

In addition, advances have been made in understanding cardiovascular risk beginning in young adulthood. The development of heart disease depends upon genetic and environmental factors and their interaction. Research over the past three decades has helped understand both the genetic and environmental impact on the development of heart disease in adults. Observations have now provided us with basic understanding of the development of cardiovascular risk beginning in early life. Also, much information is now available about dietary intake and its interrelationship to the development of CV and other diseases, such as cancer. Methods to obtain information with regard to CV risk factors, dietary

studies, and beginning health promotion have now been developed by the Specialized Center of Research - Arteriosclerosis at LSU through its work in the Bogalusa Heart Study and more recently as the National Research and Demonstration Center - Arteriosclerosis by the Heart Smart program for the Jefferson Parish School System.

Over the past two decades, significant studies have been conducted exploring the early natural history of coronary artery disease. Multidisciplinary epidemiologic studies conducted at LSU through the National Research and Demonstration Center - Arteriosclerosis and the Specialized Center of Research - Arteriosclerosis have provided both epidemiologic and experimental observations that clearly indicate the evolution of coronary artery disease beginning in youth. The major ongoing program is the Bogalusa Heart Study, an epidemiologic investigation of CV risk factors in a total pediatric population of approximately 5,000 children. The study has several advantages over previous adult programs, such as Framingham, Evans County and others. It observes changes over time, racial (black-white) contrasts, gender differences, and changes that occur with growth phases of infancy, childhood, adolescence, and young adulthood. These findings apply directly to Army personnel and their health maintenance in peace and under crisis situations. Extensive demographic, anthropometric, blood pressure, serum lipid and lipoprotein, nutritional, lifestyle, and behavioral data have been collected and are applicable to young adults. These studies have served in the past to stimulate observations by others and currently to call attention in clinical practice to the need for identifying CV risk factors measured at an early age as a basis for prevention of CV disease later in life. Identification of Army personnel with high CV risk has major implications for performance and for future efficiency and cost effectiveness for health-related problems.

One important finding in the Bogalusa Heart Study arises from autopsies of children and young adults who meet unexpected death in the community. A high correlation of antecedent CV risk factors with anatomic changes has been noted. This relationship helps validate and give credence to the clinical CV risk factors. The studies in Bogalusa are in concert with other autopsy findings made in Army personnel; i.e., a high prevalence of atherosclerotic disease and significant coronary artery disease was noted in young men in our military. In both the Korean War and later in the Vietnamese War, significant coronary artery lesions already were present in approximately 70% of the young men autopsied after field death (1,2). This is an impressive finding that has relevance to the clinical epidemiology studies on Bogalusa children and young adults.

Another area of concern is the role of nutrition in relation to CV risk. Diet obviously plays a major role in contributing to hypertension, hyperlipidemia, and obesity. The Bogalusa Heart Study data show that children are consuming a high-fat diet with low P/S ratio which is shown to be associated with an adverse lipoprotein profile. Further high sodium, low potassium, and low calcium

intakes provide a condition that predisposes certain individuals to hypertension. Obesity with high energy intake and less energy expenditure is another common finding. Our experience suggests that these dietary patterns will continue through young adulthood and beyond unless preventive measures are instituted. The current health and fitness seen in young soldiers should not be misleading.

With this background, we proposed studies in collaboration with U.S. Army Nutritional and Health Promotion Teams and with programs that relate to the high prevalence of atherosclerotic disease occurring in presumably "healthy" and "normal" military personnel and their families.

From discussions with staff of the U.S. Army Research Institute for Environmental Medicine in Natick, Massachusetts, at the Pennington Biomedical Research Center in Baton Rouge, Louisiana, and the Louisiana State University Medical Center in New Orleans, Louisiana, specific goals and project descriptions were developed.

Goals

The overall goal of this study is to reduce CV risk in military personnel and their families.

1) Are CV risk factors found in Army personnel comparable to those present in young adults in the Bogalusa Heart Study and other national programs, i.e., Lipid Research Clinics, HANES, Muscatine, CARDIA?

2) Is there an interrelationship of environmental factors, especially dietary intake, with CV risk factors in military personnel?

3) Can environmental factors, especially nutrition, be altered to improve CV risk in military personnel, their families, and their children?

4) Can health promotion and education be effective in reducing CV risk in military personnel? (As a byproduct, can health promotion affect bad lifestyles and behaviors, that is cigarette smoking, alcohol excess, drug abuse?).

Sample

Due to a combination of large size and proximity to both Baton Rouge and New Orleans, Fort Polk, Louisiana was selected as the site of delivery of our health promotion efforts. Fort Polk is the home of the 5th Mechanized Division; comprising infantry, light armor and artillery, and all support activities. Basic data on the Fort Polk population are contained in Table 1 (Appendix III). The post employs approximately 15,000 active-duty personnel and oversees the health and well-being of between 10,000 and 12,000 dependents as well as nearly 25,000 military retirees (3). We estimate approximately 5,000 in-tact families with serviceman husband, non-

military wife, and at least one child living at home. It is this group which serves as our primary, though not sole focus.

Sub-studies

Three sub-studies were proposed and accepted by the U.S. Army. These will be described separately. Since each has a somewhat different set of purposes, measures and evaluations will be included in each presentation. Protocols and sample questionnaires used have already been supplied to the U.S. Army.

Project I - Baseline Assessment of Dietary Intake and Physical Activity in Military Dependents

The purpose of this project was to quantify dietary intakes and describe usual physical activity patterns in military dependents living on or near Fort Polk, Louisiana. Specifically, we surveyed a sample of young women (spouses) to quantify nutrient intake, food purchasing patterns and pantry reserves to obtain measures of food purchasing and consumption. Several food sources are available to military dependents and the frequency of use of each was to be described. In addition, we obtained a measure of usual physical activity to assess availability and use of military and non-military exercise facilities. Subjects also underwent a CV risk factor screening. A synopsis of this sub-study is found in Table 2 (Appendix III).

ELIGIBILITY:

This program studied spouses of enlisted personnel and officers stationed at Fort Polk, Louisiana. Subjects 18-40 years old who have resided at Fort Polk for at least 3 months but less than 18 months were eligible for inclusion. This sample included dependents who had time to acclimate to the post and who were likely to remain at least two years should a follow-up survey be conducted. We proposed to study 200 subjects.

PROGRESS:

Data collection for this project began with a pilot screening in August, 1989 and continued into the main study in September, 1989. Evaluations occurred in two phases for each subject. First, a set of nutritional and activity questionnaires was delivered by trained interviewers. Second, about 2-3 weeks later a CV risk factor screening for blood pressure, blood lipids, body composition, and evaluation of health-related behaviors (smoking, alcohol consumption, etc.) was delivered. In addition, socio-demographic information (race, occupation, rank, etc.) was collected. The bulk of Project 1 screenings occurred from September through November, 1990. Clean-up screenings of eligible wives continued into May, 1990. Overall 200 subjects underwent the nutritional evaluation and 184 the risk factor screening.

Data editing and keypunching are complete for this project with the exception of about 10 dietary recalls. These latter

require some additional product and recipe research. We anticipate this process to be complete shortly.

FINDINGS:

Initial results are available for a number of parameters for the Project 1 sample. A demographic profile of the families of these women is presented in Figures 1-6 (Appendix IV). In this we can see husbands' ranks, educational achievement, family sizes, and other sociological characteristics. Overall, this sample is drawn primarily from enlisted ranks, E-5 and lower, about 55%. Officers' families account for approximately 18% of the sample. E-6 through E-9 ranks account for about 27% of total. Forty-three percent of the sample wives are high school graduates; 39% have some college; and 11% are college graduates. About half of the total consists of two-children families.

Data on eating behavior is included in Figures 7 and 8 and tables 3 and 4 (Appendix III). Here we see that about 10% of these families use Woman, Infant, Child (WIC) vouchers to supplement diets. In addition, 1.5% purchase food stamps. Military families overwhelmingly use the post commissary for food purchasing, nearly 80% listing it as their first choice. Fast food restaurants are frequented by Project 1 families with most having made at least one visit within the last month.

CV risk factor data are available for analysis on about 140 military wives. Their results are presented in Table 5. This table updates data presented in the May - July, 1990 quarterly report. Once again most results are similar with white females having the highest systolic blood pressures and lowest body mass indices. Hispanic women manifest low levels of high-density lipoprotein. Overall, results are similar to those found in the young adult population.

The percentages of military wives exceeding guidelines for lipid levels is presented in Table 7. Nine percent (n=17) demonstrated high levels of low-density lipoprotein. Three percent (n=5) showed elevated levels of very-low-density lipoprotein. And, 9% (n=5) exhibited high levels of triglycerides.

Propensity for regular physical activity is presented in Table 7 (Appendix III). Overall, about a third of these women undertake some weekly volitional exercise. Black wives exhibited a preference for aerobics and aerobic dance and a disinclination toward swimming. Hispanic women chose cycling, swimming, and aerobics. White women were intermediate in most categories but showed relatively low rates of jogging.

Project II - Cardiovascular Risk Assessment of Families At Fort Polk

The purpose of this project is to assess the traditional

cardiovascular risk factors on family units at Fort Polk. The program is directed toward the soldier, his spouse and all children at or above the age of two years. Specifically, we measure serum lipids and lipoproteins, blood pressure, body size parameters, medical and family history of disease. This provides baseline measurements before entering general health promotion programs available at Fort Polk. In addition, high risk adults and children will be identified so that individual high cardiovascular risk counseling programs can be established. A synoposis of this project may be found in Table 8 (attached).

ELIGIBILITY:

All families at entry (within 3 months of arrival at Fort Polk) are eligible for examination. A family consists of the military person (male or female) spouse and at least one child at or above the age of two years. We propose to examine at least 200 families beginning September, 1990.

PROGRESS:

Data collection for Project II began in November, 1989. By the end of July, 1990, 435 individuals have received a CV risk factor screening. This comprises the members of about 140 families. Data editing and entry is underway. Initial analysis will be available shortly.

FINDINGS:

Data on rates of elevated lipid levels are available for the first 200 adults undergoing screening. These are presented in Table 9 (Appendix III). As is the case for Project 1 women, Project 2 saw 10% exceed guidelines for low-density lipoproteins, 2.5% for very-low-density lipoproteins, and 6% for triglycerides.

Project III - Health Promotion

The purpose of this intervention is to change eating and exercise behaviors and to enhance positive psychosocial factors in servicemen (women) and their dependents. The intervention is a five-step process which includes (1) awareness development, (2) information transfer, (3) skills training, (4) psychosocial enhancement and (5) maintenance. Awareness will begin with a rationale for the intervention, an assessment of health knowledge, attitudes and beliefs and psychosocial factors, e.g., self-efficacy, social support, and positive reinforcement. An assessment of cardiovascular risk with feedback will be made. The format of each session will include subject matter presentations, cooking demonstrations, modeling and mastery experience, role playing and skits. Hands-on practice sessions will involve, for example, menu planning, food selection, label-reading, recipe modification, and exercise activities. To maintain new behaviors, participants will be taught skills to observe and assess their own behavior and stimulus control.

The long-term goal is to develop the Family Health Promotion model so that it might be utilized on military bases when applicable. A synoposis of this project may be found in Table 10 (Appendix III).

ELIGIBILITY:

The study will consist of 60 families consisting of the serviceman(woman), spouse and at least one child 5 to 10 years of age.

PROGRESS:

The first series of 12-week health education modules began on 6 military families in June, 1990. Each family member (N=35) underwent an initial risk factor evaluation, dietary examination, and psychosocial assessment. A calendar of lesson topics and activities is presented in Table 11 (Appendix III).

Future Directions

Project 1

Data entry will be completed for all aspects of Project 1 shortly. At that time correlational and multivariate analyses relating to CV risk factor levels and dietary intake can be undertaken.

Project 2

Recruitment and screening of additional Project 2 families will continue for the foreseeable future at the rate of about 40 subjects per month. Data editing and entry of screened subjects will keep pace with preliminary analysis of the first 300-350 to start shortly.

Project 3

The first phase of Project 3 family health promotion will conclude in August, 1990. Recruitment of new families for the Fall and Winter sets of sessions is underway with an anticipated start for the Fall phase in mid-September.

Discussion

The three projects outlined above continue to give a picture of health status, health-related behaviors, and potential health promotion directions for military families. Data from Projects 1 and 2 assist in guiding our Project 3 health promotion efforts. For instance, knowledge of food purchasing patterns, fast food preference, and physical activity inclinations give us guidance in the design of health promotion efforts.

From our experience at Fort Polk, we hope to develop a health

education and promotion package which can be transferred to other military installations. Such a program must easily fit into existing health promotion efforts, must be effective in inducing health promoting behaviors, and, above all, must be attractive to military families. We believe we are developing such a package.

We hope to be able to improve the health and well-being of families, and therefore, to enhance the performance of the serviceman. The U.S. Army places a large investment in each soldier. If our efforts succeed, a small investment in health promotion will yield a large dividend in health.

References

1. Enos, W.F., Holmes, R.H., and Beyer, J. 1953. Coronary disease among United States soldiers killed in action in Korea: Preliminary report. JAMA 152:1090-1093.

2. McNamara, J.J., Molot, M.A., Stremple, J.F. and Catting, R.T. 1971. Coronary artery disease in combat casualties in Vietnam. JAMA 216:1185-1187.

3. U.S. Army N.D. Fort Polk Army Community Service Information Brochure.

V. "U S Army Menu Modification Project"

INTRODUCTION AND BACKGROUND

Since 1985, nutrition initiatives have been introduced into the Armed Forces Recipe Service, the Army Master menu and the Army Food Service Program to provide soldiers with diets lower in sodium, fat, and cholesterol. The Military Nutrition Division of the United States Army Research Institute of Environmental Medicine (USARIEM) has conducted assessments of soldiers' nutrient intakes. These studies resulted in the following nutrition related recommendations: continue revision of the Armed Forces Recipe File to reduce sodium in recipes, continue to decrease the percentage of calories obtained from fat to 35% or less of total calories, and provide soldiers low cholesterol, low fat alternatives to eggs, and evaluate the acceptability and impact of using this approach to moderate soldiers' cholesterol intakes.

The Menu Modification Project incorporates modification of two weeks of Army garrison menus to meet the nutrition targets specified by the Army. The purpose of the menu modification project is to provide healthful, nutritious menu selections which moderate soldiers' sodium, fat, and cholesterol intakes.

PROGRESS

The Army Menu Modification Project began in January, 1990. Human subjects review approval was obtained from the Louisiana State University, Baton Rouge campus (LSU) Committee on the Use of Humans

and Animals as Research Subjects, the Human Use Review and Regulatory Affairs Office of the Surgeon General, U.S. Army, and the LSU Medical Center Institutional Review Board. Three part-time student workers were hired and trained to prepare menu items for taste panel testing. Recruitment, selection, orientation and training of nine volunteer taste panel participants was completed. A graduate assistant was hired to monitor preparation, service, and evaluation of approved modified menu items in the LSU athletes' dining facility. A total of 69 items were prepared and evaluated by the taste panel (Appendix V). Eighteen food formulations were prepared in quantity, served and evaluated for acceptability by the athletes in Broussard Cafeteria. These scores are attached in Appendix V.

The Extended Table of Nutrient Values (ETNV) is being used to analyze Army recipes and the corresponding modified recipes. Five separate modified recipes have been processed using the ETNV: gumbo, lasagna, corn chowder, meat loaf and Swedish meat balls. The results of these analyses are presented below in Table 1.

Table 1. Selected nutrient content of currently used vs. modified Army recipes

Regular	Modified	% Change
GUMBO	per 100 gm	
kCal	66	64	3
Total Protein, gm	4.2	9.2	219
Total CHO, gm	6.0	3.2	47
Total Fat, gm	2.8	1.6	43
SFA, gm	.6	.4	33
Cholesterol, mg	10	40	400
Sodium, mg	572	183	68
LASAGNA			
kCal	177	135	24
Total Protein, gm	11.6	11.3	3
Total CHO, gm	11.4	11.6	2
Total Fat, gm	9.3	4.9	47
SFA, gm	4.4	2.3	48
Cholesterol, mg	61	30	51
Sodium, mg	323	325	1
CORN CHOWDER			
kCal	78	66	15
Total Protein, gm	3.0	2.9	3
Total CHO, gm	11.4	11.2	2
Total Fat, gm	2.8	1.5	46
SFA, gm	.7	.3	57

Cholesterol, mg	2	1	50
Sodium, mg	351	143	59
MEAT LOAF			
kCal	244	217	11
Total Protein, gm	12.6	13.7	8
Total CHO, gm	7.3	11.0	34
Total Fat, gm	18.0	13.0	28
SFA, gm	7.2	4.9	32
Cholesterol, mg	84	56	33
Sodium, mg	468	458	2
SWEDISH MEAT BALLS			
kCal	185	172	7
Total Protein, gm	8.2	9.2	11
Total CHO, gm	5.4	6.3	14
Total Fat, gm	14.3	12.1	15
SFA, gm	5.0	3.8	24
Cholesterol, mg	45	39	13
Sodium, mg	140	168	17

As can be seen in Table 1, fat generally decreased by 15-47% (mean = 36%), with saturated fatty acids (SFA) decreasing by 24-57% (mean=39%). Total calories were somewhat reduced (range = 3-24%, mean = 11%. Total carbohydrate did not show a specific trend, but rather increased in some cases and decreased in others. Cholesterol generally decreased but was not higher than 56 mg/100 gm in any of the modified recipes. A specific instance of increased cholesterol was in the gumbo which was modified to contain more protein, as well as more cholesterol; the intention was that this item be a main dish item rather than a soup as it appeared to be for the Army. Thus, the cholesterol increased, but only a total of 40 mg/100 gm. Four of the five recipes had sodium levels of 325 mg/100 gm or lower, while the modified Army meat loaf had a sodium content of 458 gm/100 gm which was 10 mg less than the original Army recipe.

One full day's menu as served by the Army has been analyzed for nutrient content using the ETNV as well as the corresponding modified menu.

Table 2 contains the day's menu with the modification for that meal indicated.

Table 2. Regular and modified Army menu for one day

Regular	Modified
BREAKFAST	
Orange Juice	Same
Fried Eggs	No
Bacon	No
2% Milk	Same
Coffee, sugar	Same
Coffee Cake	Breakfast Casserole
LUNCH	
French Bread	Same
Margarine	Same
2% Milk	Same
Swedish Meatballs	Swedish Meatballs (Modified)
Steamed Rice	Same
Waldorf Salad	Same
Vegetable Combination	Same
Sugar Cookies	Same
DINNER	
Cola	Same
Bread	Same
Margarine	Same
Seasoned Peas	Same
Beef Barley Soup	Same
Roast Beef	Lemon Barbequed Catfish
Dutchess Potatoes	Same
Relish Plate, Croutons	Same
Almond Pound Cake	Same

While both the regular and modified Army menu met the Recommended Dietary Allowances (RDA) for most nutrients, some differences were noted. Kilocalories for the regular menu was 3168 which was 109% of the suggested level for kcalories in this age group. The modified menu contained 2759 kcal, 95% of the suggested RDA level. Table 3 contains nutrient information on the menus described in Table 2.

While in one day's menu striking differences were not seen, when interpreted as percentage of calories, some trends were noted. Fat was somewhat lowered from 42.5 to 39% of calories. Protein and carbohydrate, as a percentage of calories, increased which allowed for the beneficial lowering of fat in the day's diet.

Reduction of some of the eggs consumed resulted in the decrease from 814 mg to 450 mg of cholesterol. However, the dutchess potatoes dish contained a large amount of egg and was not eliminated from the modified menu. A creamed potato dish, if

included in the modification, would further decrease the cholesterol content of the day's menu.

Table 3. Content of selected nutrients in the current regular and modified Army menu

Nutrient	Regular [as % of kCal]		Modified [as % of kCal]	
kCal	3168		2759	
Protein, gm	122.0	[15.0]	117.8	[17.1]
Fat, gm	149.5	[42.5]	119.6	[39.0]
SFA, gm	45.6	[13.0]	36.9	[12.0]
CHO, gm	331.5	[41.9]	305.6	[44.3]
Cholesterol, mg	814		450	
Sodium, mg	4328		4444	

Unfortunately, sodium content of the modified menu was almost 100 mg higher than that of the current menu. This was due in part to the inclusion of ground turkey in the modified Swedish meat balls dish. The content of sodium in ground turkey is higher than that of ground meat. Eliminating salt in the preparation of modified recipes could lower the sodium content of the recipes used in the menu modification program.

Comprehensive analyses of the current and modified Army menus described in Table 2 are included in Appendix VI.

Pennington Biomedical Research Center
LOUISIANA STATE UNIVERSITY

December 8, 1989

CPT Robert J. Moore
US Army Research Institute of Environmental Medicine
ATTN: SGRD-UE-NR (CPT Moore)
Natick, MA 01760-5007

Dear Captain Moore:

Enclosed are plasma lactate results from the HURC# 372 study. I will send more details on the method at a later date for your files, but briefly the method is linear from 0-5 mmol/L (all samples over 5 mmol/L were diluted and re-run), has a mean recovery of 96.2% (range: 93.6-100.0%) for added levels of lactate from 0.89-3.27 mmol/L, and has a day to day coefficient of variation of 1.6% at 2.3 mmol/L. I have listed the results by subject number and sampling time; please let me know if you would prefer a different report format for future results.

I am planning on running the carbohydrate load study samples next week for glucose, triglyceride, la tate, beta hydroxybutyrate, free fatty acids, ammonia, and glycerol. We have just received the amino acid reagents and have begun working on this method. It may take a little time for us to get it working so I'll send the other results when I get them.

Sincerely,

Richard Tulley

Richard Tulley, Ph.D.
Clinical Research Laboratory

6400 Perkins Road, Baton Rouge, Louisiana 70808-4124 • Phone: (504) 767-0880, Fax: (504) 765-2525

PENNINGTON BIOMEDICAL RESEARCH CENTER
Clinical Research Laboratory
Baton Rouge, Louisiana 70808-4124

SUBJ #	DATE	SAMPLE ID	LACTATE, mmol/L
1	08/16/89	1C-L-PRE	1.49
1	08/16/89	1C-L-1"	1.63
1	08/16/89	1C-L-2.5	1.55
1	08/16/89	1C-L-4"	1.47
1	08/16/89	1C-L-5.5"	1.65
1	08/16/89	1C-L-7"	1.82
1	08/16/89	1C-L-8.5	2.45
1	08/16/89	1C-L-10	2.91
1	08/16/89	1C-L-11.5	4.71
1	08/16/89	1C-L-13"	6.00
1	08/16/89	1C-L-14.5	8.26
1	08/30/89	1C-N-PRE	1.21
1	08/30/89	1C-N-1"	1.19
1	08/30/89	1C-N-2.5"	1.16
1	08/30/89	1C-N-4"	1.17
1	08/30/89	1C-N-5.5"	1.31
1	08/30/89	1C-N-7"	1.64
1	08/30/89	1C-N-8.5"	1.96
1	08/30/89	1C-N-10"	2.59
1	08/30/89	1C-N-11.5	3.68
1	08/30/89	1C-N-13"	4.88
1	08/30/89	1C-N-14.5	8.32
1	08/13/89	1C-H-PRE	1.07
1	08/13/89	1C-H-1	1.11
1	08/13/89	1C-H-2.5"	1.15
1	08/13/89	1C-H-4"	1.12
1	08/13/89	1C-H-5.5"	1.21
1	08/13/89	1C-H-7"	1.73
1	08/13/89	1C-H-8.5"	2.20
1	08/13/89	1C-H-10"	2.89
1	08/13/89	1C-H-11.5	3.73
1	08/13/89	1C-H-13"	5.24
2	08/16/89	2C-L-PRE	0.86
2	08/16/89	2C-L-2.5"	1.01
2	08/16/89	2C-L-1"	0.93
2	08/16/89	2C-L-4"	1.01
2	08/16/89	2C-L-5.5"	1.02
2	08/16/89	2C-L-7"	1.31
2	08/16/89	2C-L-8.5"	1.88
2	08/16/89	2C-L-10"	2.67
2	08/16/89	2C-L-11.5	4.05
2	08/16/89	2C-L-13"	6.52
2	08/16/89	2C-L-14.5	8.28
2	08/30/89	2C-N-PRE	1.59
2	08/30/89	2C-N-1"	1.56
2	08/30/89	2C-N-2.5"	1.64
2	08/30/89	2C-N-4"	1.50
2	08/30/89	2C-N-5.5"	1.95
2	08/30/89	2C-N-7"	2.43

SUBJ #	DATE	SAMPLE ID	LACTATE, mmol/L
2	08/30/89	2C-N-8.5"	2.91
2	08/30/89	2C-N-10"	3.64
2	08/30/89	2C-N-11.5	4.71
2	08/30/89	2C-N-13"	6.08
3	08/16/89	3C-L-PRE	1.10
3	08/16/89	3C-L-1"	1.12
3	08/16/89	3C-L-2.5"	1.16
3	08/16/89	3C-L-4"	1.19
3	08/16/89	3C-L-5.5"	1.22
3	08/16/89	3C-L-7"	1.63
3	08/16/89	3C-L-8.5"	2.13
3	08/16/89	3C-L-10"	2.76
3	08/16/89	3C-L-11.5	3.13
3	08/16/89	3C-L-13"	3.96
3	08/16/89	3C-L-16"	7.16
3	08/16/89	3C-L-17.5	9.76
3	08/30/89	3C-N-PRE	0.87
3	08/30/89	3C-N-1"	1.03
3	08/30/89	3C-N-2.5"	1.00
3	08/30/89	3C-N-4"	0.85
3	08/30/89	3C-N-5.5"	1.16
3	08/30/89	3C-N-7"	1.52
3	08/30/89	3C-N-8.5"	1.58
3	08/30/89	3C-N-10"	2.68
3	08/30/89	3C-N-11.5	3.73
3	08/30/89	3C-N-89	5.42
3	08/30/89	3C-N-14.5	8.58
3	08/13/89	3C-H-PRE	1.21
3	08/13/89	3C-H-1"	1.08
3	08/13/89	3C-H-2.5"	1.08
3	08/13/89	3C-H-4"	1.17
3	08/13/89	3C-H-5.5"	1.42
3	08/13/89	3C-H-7"	1.91
3	08/13/89	3C-H-8.5"	2.65
3	08/13/89	3C-H-10"	3.36
3	08/13/89	3C-H-11.5	4.35
3	08/13/89	3C-H-13"	5.74
3	08/13/89	3C-H-14.5	7.14
4	08/16/89	4C-L-PRE	0.88
4	08/16/89	4C-L-1"	0.91
4	08/16/89	4C-L-2.5"	0.86
4	08/16/89	4C-L-4"	0.82
4	08/16/89	4C-L-5.5"	0.88
4	08/16/89	4C-L-7"	1.23
4	08/16/89	4C-L-8.5"	1.60
4	08/16/89	4C-L-10"	2.27
4	08/16/89	4C-L-11.5	3.28
4	08/16/89	4C-L-13"	5.40
4	08/16/89	4C-L-14.5	8.56

SUBJ #	DATE	SAMPLE ID	LACTATE, mmol/L
4	08/30/89	4C-N-PRE	1.67
4	08/30/89	4C-N-1"	1.66
4	08/30/89	4C-N-2.5"	1.62
4	08/30/89	4C-N-4"	1.64
4	08/30/89	4C-N-5.5"	1.82
4	08/30/89	4C-N-7"	2.14
4	08/30/89	4C-N-8.5"	2.78
4	08/30/89	4C-N-10"	3.49
4	08/30/89	4C-N-11.5	4.48
4	08/30/89	4C-N-13"	6.34
4	08/30/89	4C-N-14.5	9.80
4	08/14/89	4C-H-PRE	1.93
4	08/14/89	4C-H-1"	1.91
4	08/14/89	4C-H-2.5"	1.68
4	08/14/89	4C-H-4"	1.83
4	08/14/89	4C-H-5.5"	2.12
4	08/14/89	4C-H-7"	2.51
4	08/14/89	4C-H-8.5"	3.03
4	08/14/89	4C-H-10"	4.09
4	08/14/89	4C-H-11.5	5.56
4	08/14/89	4C-H-13"	7.64
4	08/14/89	4C-H-14.5	10.40
7	08/17/89	7D-PRE	1.46
7	08/17/89	7D-1"	1.20
7	08/17/89	7D-2.5"	1.00
7	08/17/89	7D-4"	1.11
7	08/17/89	7D-5.5"	1.23
7	08/17/89	7D-7"	1.59
7	08/17/89	7D-8.5"	1.70
7	08/17/89	7D-10"	2.54
7	08/17/89	7D-11.5"	3.59
7	08/17/89	7D-13"	5.68
8	08/17/89	8D-PRE	1.50
8	08/17/89	8D-1"	1.48
8	08/17/89	8D-2.5"	1.60
8	08/17/89	8D-4"	1.67
8	08/17/89	8D-5.5"	1.88
8	08/17/89	8D-7"	2.33
8	08/17/89	8D-8.5"	2.94
8	08/17/89	8D-10"	3.49
8	08/17/89	8D-11.5"	3.88
8	08/17/89	8D-13"	5.22
8	08/17/89	8D-14.5"	6.80
8	08/17/89	8D-16"	9.50
8	08/31/89	8D-PRE	1.12
8	08/31/89	8D-1"	1.17
8	08/31/89	8D-2.5"	1.16
8	08/31/89	8D-4"	1.17
8	08/31/89	8D-5.5"	1.28

SUBJ #	DATE	SAMPLE ID	LACTATE, mmol/L
8	08/31/89	8D-7"	1.47
8	08/31/89	8D-8.5"	1.84
8	08/31/89	8D-10"	2.50
8	08/31/89	8D-11.5"	3.34
8	08/31/89	8D-13"	4.77
8	08/31/89	8D-14.5"	7.38
8	08/14/89	8D-PRE	0.73
8	08/14/89	8D-1"	0.72
8	08/14/89	8D-2.5"	0.72
8	08/14/89	8D-4"	0.71
8	08/14/89	8D-5.5"	0.81
8	08/14/89	8D-7"	1.03
8	08/14/89	8D-8.5"	1.32
8	08/14/89	8D-10"	1.75
8	08/14/89	8D-11.5"	2.68
8	08/14/89	8D-13"	4.13
8	08/14/89	8D-14.5"	6.84
9	08/17/89	9C-L-PRE	0.94
9	08/17/89	9C-L-1"	0.90
9	08/17/89	9C-L-2.5"	0.86
9	08/17/89	9C-L-4"	0.83
9	08/17/89	9C-L-5.5"	1.00
9	08/17/89	9C-L-7"	1.31
9	08/17/89	9C-L-8.5"	1.82
9	08/17/89	9C-L-10"	2.91
9	08/17/89	9C-L-11.5	3.87
9	08/17/89	9C-L-13"	4.99
9	08/17/89	9C-L-14.5	7.28
9	08/17/89	9C-L-16"	9.04
9	08/31/89	9C-N-PRE	1.96
9	08/31/89	9C-N-1"	1.73
9	08/31/89	9C-N-2.5"	1.61
9	08/31/89	9C-N-4"	1.55
9	08/31/89	9C-N-5.5"	1.53
9	08/31/89	9C-N-7"	1.88
9	08/31/89	9C-N-8.5"	2.53
9	08/31/89	9C-N-10"	3.22
9	08/31/89	9C-N-11.5	4.59
9	08/31/89	9C-N-13"	6.32
9	08/31/89	9C-N-14.5	8.98
9	08/31/89	9C-N-16"	12.60
9	08/13/89	9C-H-PRE	1.50
9	08/13/89	9C-H-1"	1.37
9	08/13/89	9C-H-2.5"	1.31
9	08/13/89	9C-H-4"	1.40
9	08/13/89	9C-H-5.5"	1.30
9	08/13/89	9C-H-7"	1.69
9	08/13/89	9C-H-8.5	2.27
9	08/13/89	9C-H-10"	3.09

SUBJ #	DATE	SAMPLE ID	LACTATE, mmol/L
9	08/13/89	9C-H-11.5	4.63
9	08/13/89	9C-H-13"	6.60
9	08/13/89	9C-H-14.5	9.36
9	08/13/89	9C-H-16"	12.84

Pennington Biomedical Research Center
LOUISIANA STATE UNIVERSITY

January 3, 1990

CPT Robert J. Moore
US Army Research Institute of Environmental Medicine
ATTN: SGRD-UE-NR (CPT Moore)
Natick, MA 01760-5007

Dear Captain Moore:

Enclosed are the results from the Carbohydrate/Load Bearing Study. The abbreviations are as follows:

GLOL=glycerol
NEFA=non esterified fatty acids (free fatty acids)
LACT=lactate
BHBA=beta hydroxybutyric acid
GLU=glucose
TRIG=triglyceride (this is reported in mg/dl and converted to mmol/l in the next column.
TRIG-GLOL=true triglyceride. Our TRIG method does not blank for glycerol, so subtracting glycerol will result in the "true" triglyceride value.
AMMO=plasma ammonia

All results, except for ammonia and for specimen 1-2-2, were obtained using serum samples. There was no serum sample on specimen 1-2-2 so all analyses were done using plasma. No plasma was sent for specimen 4-2-2, so an accurate ammonia could not be determined.

The ammonia on specimen 7-3-3 is real. I checked it several times. Perhaps the specimen was contaminated or was not put on ice immediately.(?) The sample was slightly hemolyzed, however, specimen 5-1-2 was more hemolyzed and didn't have too high a level.

Please let me know if you want the amino acid analyses. There is enough of each sample left over for these and other tests, if you want.

Did you get the lactate results? How do they look?

Happy new year to you and best of luck with the studies.

Sincerely,

Richard Tulley

Richard T. Tulley, Ph.D.
Clinical Research Lab Manager

6400 Perkins Road, Baton Rouge, Louisiana 70808-4124 • Phone: (504) 767-0880, Fax (504) 765 2525

PENNINGTON BIOMEDICAL RESEARCH CENTER

Clinical Research Laboratory

USARIEM Carbohydrate/Load Bearing Study

SAMPLE	GLOL umol/l	NEFA mmol/l	LACT mmol/l	BHBA mmol/l	GLU mg/dl	TRIG mg/dl	TRIG mmol/l	TRIG-GLOL mmol/l	AMMO umol/l
1-1-1	61	0.04	1.68	0.01	70	119	1.34	1.28	15.6
1-1-3	738	2.24	2.34	0.33	90	122	1.38	0.64	38.9
1-2-1	55	0.07	1.89	0.01	75	111	1.25	1.20	20.2
*1-2-2	417	1.70	1.46	0.21	90	121	1.37	0.95	18.7
1-2-3	671	1.45	2.37	0.25	86	109	1.23	0.56	17.2
1-3-1	88	0.12	1.55	0.01	71	93	1.05	0.96	34.4
1-3-3	694	2.03	1.90	0.51	81	99	1.12	0.42	13.9
2-1-1	48	0.10	1.93	0.01	108	77	0.87	0.82	21.9
2-1-3	299	1.45	2.06	0.39	85	81	0.92	0.62	29.1
2-2-1	35	0.05	2.29	0.02	110	104	1.18	1.14	27.8
2-2-3	162	0.51	2.50	0.02	82	181	2.05	1.88	65.4
3-1-1	56	0.09	1.74	0.00	81	59	0.67	0.61	33.1
3-1-2	489	1.62	1.98	0.20	106	79	0.89	0.40	42.1
3-1-3	457	1.39	2.29	0.30	91	91	1.03	0.57	70.6
3-2-1	138	0.92	1.19	0.47	93	52	0.59	0.45	26.2
3-2-3	595	2.11	1.60	0.57	96	92	1.04	0.44	18.8
3-3-1	95	0.45	1.18	0.04	93	76	0.86	0.76	18.0
3-3-3	500	1.65	1.80	0.36	102	102	1.15	0.65	60.3
4-1-1	57	0.10	1.28	0.20	136	62	0.70	0.64	31.2
4-1-3	530	1.62	3.14	0.32	90	105	1.19	0.66	53.4
4-2-1	97	0.70	1.41	0.16	118	53	0.60	0.50	9.9
4-2-2	511	2.37	1.91	0.38	98	76	0.86	0.35	no plasma
4-2-3	508	2.36	1.89	0.37	96	77	0.87	0.36	36.8
4-3-1	56	0.31	1.38	0.03	93	54	0.61	0.55	11.3
4-3-3	435	1.86	2.19	0.33	88	75	0.85	0.41	27.4
5-1-1	108	0.20	1.51	0.02	112	68	0.77	0.66	13.0
5-1-2	546	1.30	3.22	0.19	93	71	0.80	0.26	15.8
5-1-3	616	1.80	3.00	0.38	87	80	0.90	0.29	7.8
7-1-1	49	0.05	2.14	0.01	108	117	1.32	1.27	47.8
7-1-2	373	1.08	2.08	0.07	111	119	1.34	0.97	40.2
7-1-3	567	2.30	2.29	0.29	111	110	1.24	0.68	17.4
7-2-1	77	0.15	1.58	0.02	90	123	1.39	1.31	23.2
7-2-3	573	0.85	2.46	0.12	105	115	1.30	0.73	26.3
7-3-1	40	0.04	1.86	0.01	91	136	1.54	1.50	21.6
7-3-2	411	0.97	2.20	0.04	117	158	1.79	1.37	36.5
7-3-3	645	1.45	3.27	0.11	108	145	1.64	0.99	607.2

SAMPLE	GLOL umol/l	NEFA mmol/l	LACT mmol/l	BHBA mmol/l	GLU mg/dl	TRIG mg/dl	TRIG mmol/l	TRIG-GLOL mmol/l	AMMO umol/l
8-1-1	70	0.07	1.76	0.00	79	76	0.86	0.79	47.3
8-1-2	467	0.86	2.49	0.11	98	77	0.87	0.40	33.1
8-1-3	653	1.37	2.05	0.29	72	88	0.99	0.34	23.0
8-2-1	73	0.15	1.75	0.01	76	62	0.70	0.63	9.7
8-2-3	304	0.59	1.48	0.09	90	62	0.70	0.40	16.8
8-3-1	116	0.36	1.05	0.06	66	47	0.53	0.42	18.3
8-3-2	819	2.38	1.74	0.44	87	91	1.03	0.21	5.1
8-3-3	972	2.04	2.72	0.48	77	103	1.16	0.19	8.5
9-1-1	83	0.47	2.14	0.34	92	49	0.55	0.47	7.7
9-1-3	583	1.40	2.56	0.32	89	89	1.01	0.42	38.0
9-2-1	76	0.21	1.57	0.03	95	70	0.79	0.72	12.2
9-2-3	572	1.35	2.95	0.22	98	101	1.14	0.57	46.6
9-3-1	37	0.05	1.26	0.00	61	79	0.89	0.86	22.6
9-3-2	311	0.90	2.36	0.08	88	111	1.25	0.94	49.8
9-3-3	466	1.62	2.89	0.25	95	107	1.21	0.74	38.0

* all results for specimen 1-2-2 were obtained using plasma-no serum available.

Pennington Biomedical Research Center
LOUISIANA STATE UNIVERSITY

May 23, 1990

Captain Carl Friedl
Department of the Army
US Army Research Institute of Environmental Medicine
Natick Massachusetts 01780-5007

Dear Captain Friedl:

Enclosed please find the chemistry results for the West Point Study. These include cholesterol, triglyceride, HDL, LDL, iron, TIBC, UIBC, and Percent Iron Saturation. The B12/Folate and Ferritin results are still pending and will be forwarded to you as soon as we are finished with them.

I have also included a disk with a Lotus 123 file of these results for your convenience. If you have any questions please feel free to phone me.

Sincerely,

Richard Tulley

Richard Tulley, Ph.D.
Clin. Res. Lab Director

6400 Perkins Road, Baton Rouge, Louisiana 70808-4124 • Phone: (504) 767-0880, Fax: (504) 765-2525

PENNINGTON BIOMEDICAL RESEARCH CENTER
Clinical Research Laboratory
Baton Rouge, LA 70808-4124

West Point Study-Chemistries

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SAT	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	
SAMPLE #									
101	122	44	37	76	64	442	378	14.5	
102	186	63	49	124	59	284	225	20.8	
103	171	93	39	113	60	292	232	20.5	
104	163	56	48	104	60	367	307	16.3	
105	187	74	54	118	31	314	283	9.9	
106	138	86	38	83	71	286	215	24.8	
107	125	90	41	66	136	271	135	50.2	
108	163	87	36	110	97	313	216	31.0	
109	153	47	55	89	37	321	284	11.5	SLIGHLTLY HEMOLYZED
110	123	46	50	64	71	306	235	23.2	
111	121	64	69	39	47	296	249	15.9	
112	183	75	72	96	79	327	248	24.2	
113	177	134	53	97	10	383	373	2.6	
114	125	108	32	71	120	329	209	36.5	
115	164	97	36	109	36	332	296	10.8	
116	141	109	45	74	47	292	245	16.1	
117	141	85	42	82	43	344	301	12.5	
118	165	89	48	99	84	290	206	29.0	
119	200	116	38	139	33	411	378	8.0	
120	123	51	42	71	59	354	295	16.7	
121	167	60	57	98	39	387	348	10.1	
122	161	251	34	77	48	313	265	15.3	LIPEMIC
123	162	86	50	95	142	280	138	50.7	SLIGHTLY HEMOLYZED
124	165	67	79	73	81	344	263	23.5	
125	168	92	33	117	48	309	261	15.5	
126	153	186	34	82	48	336	288	14.3	LIPEMIC
127	121	73	36	70	65	283	218	23.0	
128	140	50	45	85	169	294	125	57.5	
129	114	54	47	56	80	328	248	24.4	
130	176	62	60	104	102	282	180	36.2	
131	118	82	40	62	73	305	232	23.9	
132	155	99	46	89	34	295	237	12.5	
133	74	69	23	37	49	271	222	18.1	
134	128	55	54	63	49	290	241	16.9	
201	104	42	45	51	31	297	266	10.4	
202	159	110	47	90	108	399	291	27.1	
203	175	78	59	100	96	328	232	29.3	
204	173	51	54	109	42	329	287	12.8	
205	183	86	44	122	91	326	235	27.9	
206	151	92	34	99	46	401	355	11.5	
207	156	63	67	76	35	349	314	10.0	
208	187	59	72	103	50	363	313	13.8	HEMOLYZED
209	152	64	45	94	37	359	322	10.3	

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SAT	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	
SAMPLE #									
210	172	51	76	86	62	296	234	20.9	
210R	185	122	46	115	75	298	223	25.2	
211	158	92	39	101	55	327	272	16.8	
212	142	46	52	81	135	319	184	42.3	
213	209	148	49	130	85	325	240	26.2	
214	114	57	44	59	37	356	319	10.4	
215	171	116	46	102	41	307	266	13.4	
216	211	186	40	134	110	309	199	35.6	
217	164	63	48	103	46	337	291	13.6	
218	147	88	54	75	35	301	266	11.6	
219	141	80	40	85	121	318	197	38.1	
220	198	142	53	117	86	311	225	27.7	
221	193	161	33	128	54	349	295	15.5	
222	122	63	50	59	32	274	242	11.7	
223	155	62	37	106	33	359	326	9.2	
224	123	86	48	58	77	322	245	23.9	
225	176	90	51	107	72	343	271	21.0	
226	202	125	56	121	105	299	194	35.1	
227	136	81	36	84	62	318	256	19.5	
228	182	56	59	112	95	329	234	28.9	
229	123	75	37	71	27	349	322	7.7	
230	136	98	37	79	94	391	297	24.0	
231	183	111	38	123	99	317	218	31.2	
232	162	67	44	105	112	326	214	34.4	
233	143	68	35	94	80	314	234	25.5	
234	206	55	93	102	42	332	290	12.7	
235	196	121	43	129	81	367	286	22.1	
301	211	115	46	142	89	356	267	25.0	
302	130	44	50	71	62	303	241	20.5	
303	176	115	45	108	100	369	269	27.1	
304	150	79	51	83	98	278	180	35.3	
305	178	45	72	97	52	320	268	16.3	
306	141	58	64	65	54	323	269	16.7	
307	134	53	53	70	27	299	272	9.0	
308	172	62	72	88	38	362	324	10.5	
309	145	52	40	95	71	348	277	20.4	
310	156	91	44	94	45	351	306	12.8	
311	99	55	41	47	78	222	144	35.1	
312	120	47	56	55	81	309	228	26.2	
313	183	109	32	129	48	309	261	15.5	
314	192	99	46	126	54	336	282	16.1	SL. HEMOLYZED,LIPEMIC
315	106	50	58	38	54	361	307	15.0	
316	148	56	56	81	33	279	246	11.8	

PENNINGTON BIOMEDICAL RESEARCH CENTER

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SAT	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	
SAMPLE #									
317	161	55	52	98	68	257	189	26.5	
318	135	129	42	67	54	352	298	15.3	
319	170	66	52	105	46	341	295	13.5	
320	160	56	53	96	35	407	372	8.6	
321	168	57	44	113	54	296	242	18.2	
322	161	94	60	82	49	314	265	15.6	
323	134	54	56	67	90	371	281	24.3	
324	244	83	46	181	153	328	175	46.6	
325	129	67	41	75	74	314	240	23.6	
326	154	97	42	93	36	285	249	12.6	
327	178	75	47	116	82	267	185	30.7	
328	174	82	64	94	68	366	298	18.6	
330	145	59	63	70	33	260	227	12.7	
332	163	112	48	93	48	337	289	14.2	
333	150	81	42	92	112	253	141	44.3	
335	142	83	40	85	36	305	269	11.8	
336	124	65	44	67	47	247	200	19.0	
337	165	94	44	102	26	277	251	9.4	
343	153	40	51	94	113	338	225	33.4	
346	236	136	47	162	114	326	212	35.0	
347	181	68	47	120	25	294	269	8.5	
348	140	51	47	83	89	322	233	27.6	
349	144	181	34	74	65	276	211	23.6	SLIGHTLY LIPEMIC
351	165	119	44	97	173	294	121	58.8	
358	147	51	54	83	120	400	280	30.0	
359	147	50	53	84	45	382	337	11.8	SLIGHTLY HEMOLYZED
360	200	115	56	121	68	356	288	19.1	
363	127	46	56	62	65	294	229	22.1	
365	107	59	59	36	87	295	208	29.5	
366	154	61	51	91	23	516	493	4.5	
369	148	65	58	77	27	440	413	6.1	
371	140	46	48	83	22	286	264	7.7	
372	137	56	41	85	35	459	424	7.6	
375	187	92	63	106	98	342	244	28.7	
380	121	49	48	63	84	353	269	23.8	
381	176	71	56	106	61	289	228	21.1	
382	173	82	50	107	100	275	175	36.4	
383	134	36	58	69	66	310	244	21.3	
384	202	126	44	133	51	312	261	16.3	SLIGHTLY LIPEMIC
389	138	136	54	57	53	335	282	15.8	
401	140	95	44	77	19	369	350	5.1	
402	177	60	62	103	50	301	251	16.6	
403	142	58	48	82	94	375	281	25.1	

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SAT	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	
SAMPLE #									
404	134	70	38	82	59	340	281	17.4	
405	200	90	57	125	44	382	338	11.5	
406	172	87	54	101	96	327	231	29.4	
407	178	73	68	95	184	315	131	58.4	
408	161	73	45	101	37	293	256	12.6	
409	186	71	54	118	66	338	272	19.5	
411	200	78	67	117	69	354	285	19.5	HEMOLYZED
412	144	72	66	64	77	285	208	27.0	
413	191	52	75	106	53	344	291	15.4	
414	118	74	40	63	78	333	255	23.4	
415	165	67	56	96	9	390	381	2.3	
416	185	79	87	82	10	347	337	2.9	
417	170	68	62	94	23	390	367	5.9	
418	149	66	52	84	18	401	383	4.5	
419	212	71	65	133	30	317	287	9.5	
420	143	55	56	76	70	354	284	19.8	
421	208	87	72	119	34	396	362	8.6	
422	129	52	46	73	41	305	264	13.4	
423	127	48	57	60	95	361	266	26.3	
424	168	94	40	109	43	359	316	12.0	
425	162	68	51	97	25	357	332	7.0	
426	138	75	54	69	52	350	298	14.9	
427	176	58	61	103	62	376	314	16.5	
428	149	69	74	61	20	282	262	7.1	
429	219	125	65	129	83	308	225	26.9	
430	195	169	45	116	54	299	245	18.1	
431	158	74	94	49	58	420	362	13.8	
432	191	77	69	107	28	557	529	5.0	
433	184	70	62	108	37	335	298	11.0	
435	143	68	73	56	113	328	215	34.5	
436	177	60	65	100	42	390	348	10.8	
438	174	82	53	105	102	322	220	31.7	
439	160	65	41	106	92	266	174	34.6	
440	193	71	63	116	32	441	409	7.3	
446	150	96	47	84	90	386	296	23.3	
450	157	61	74	71	34	317	283	10.7	
501	173	87	50	106	94	324	230	29.0	
504	184	83	85	82	29	374	345	7.8	
505	160	48	53	97	24	393	369	6.1	
506	188	58	70	106	161	340	179	47.4	
507	171	43	79	83	72	523	451	13.8	
508	166	57	66	89	97	365	268	26.6	
509	175	76	75	85	31	407	376	7.6	

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SAT	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	
SAMPLE #									
510	184	53	49	124	129	321	192	40.2	
511	129	63	52	64	65	374	309	17.4	
512	132	47	61	62	44	308	264	14.3	
513	128	206	52	35	40	353	313	11.3	
514	140	44	68	63	239	358	119	66.8	
515	158	60	51	95	128	289	161	44.3	
516	113	36	48	58	57	245	188	23.3	
517	162	76	47	100	78	435	357	17.9	
518	151	41	54	89	25	416	391	6.0	
519	143	71	42	87	93	255	162	36.5	
527	154	60	50	92	107	271	164	39.5	
533	187	62	70	105	35	318	283	11.0	
571	153	69	54	85	61	265	204	23.0	
601	190	106	46	123	62	291	229	21.3	
602	201	43	65	127	34	375	341	9.1	
603	221	85	61	143	97	329	232	29.5	
604	185	71	53	118	37	359	322	10.3	
605	167	56	55	101	117	263	146	44.5	
606	150	74	44	91	25	391	366	6.4	
607	152	84	52	83	62	342	280	18.1	
608	191	65	58	120	19	406	387	4.7	
609	163	79	57	90	35	359	324	9.7	
610	152	61	42	98	41	322	281	12.7	
611	148	52	50	88	71	400	329	17.8	
612	153	77	46	92	16	443	427	3.6	
613	124	39	44	72	118	264	146	44.7	HEMOLYZED
614	179	50	80	89	80	319	239	25.1	
615	153	61	54	87	21	343	322	6.1	
616	139	52	52	77	95	352	257	27.0	
617	181	58	86	83	201	349	148	57.6	
618	191	60	78	101	98	353	255	27.8	
619	172	67	91	68	60	275	215	21.8	
620	139	48	60	69	61	311	250	19.6	
621	141	35	59	75	28	337	309	8.3	
622	150	87	42	91	158	311	153	50.8	
623	178	67	54	111	101	353	252	28.6	
624	138	75	66	57	29	382	353	7.6	
625	158	105	55	82	21	344	323	6.1	
626	138	111	64	52	40	349	309	11.5	
627	214	82	47	151	21	428	407	4.9	
628	121	44	56	56	44	275	231	16.0	
629	127	44	61	57	19	445	426	4.3	
630	137	52	68	59	39	322	283	12.1	

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SAT	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	
SAMPLE #									
631	149	131	40	83	36	403	367	8.9	
632	132	70	51	67	74	250	176	29.6	
633	168	96	56	93	46	394	348	11.7	
634	202	57	60	131	33	340	307	9.7	
701	167	77	55	97	80	268	188	29.9	
801	170	73	60	95	58	319	261	18.2	

Pennington Biomedical Research Center
LOUISIANA STATE UNIVERSITY

July 16, 1990

Captain Carl Friedl
Department of the Army
US Army Research Institute of Environmental Medicine
Natick, MA 01780-5007

Dear Captain Friedl:

Enclosed are the completed results for the West Point Study. Also included is a Lotus 123 data disk with all of the files.

As I mentioned to you on the phone, many of the samples were not received, especially for the red cell folates. Apparently some of these samples were processed incorrectly prior to shipment to us, because we received many concentrated red cell samples rather than the appropriate dilutions with ascorbic acid. Samples for which there are no specimens for red cell folates are as follows:

101	103	104-106	108-109	111-115
117	119-123	126	128	130-131
133-201	203-204	206	209	211-212
217	223-225	227-230	233-234	302-303
305-306	308	311-312	314-317	319-320
323-325	327	330-333	335	337
346	348	351	358-360	363
365-366	368	371-372	380-381	383-384
389	402-409	414-415	417-418	421-429
431-433	436-439	501	505	507-508
510	512	514-515	519-604	607-608
610-611	613	615-622	624-625	627
631-634	702-801	(146 samples)		

Some samples were received for only RBC folate and nothing else. These include the following:

334	339-340	357	362	364
367	370	373	376-378	386
443-445	447-449	635	(17 samples)	

No hematocrits were received for the following specimens:

108	334	339-342	347	357
362	365	367	370	373

6400 Perkins Road, Baton Rouge, Louisiana 70808-4124 • Phone: (504) 767-0880, Fax: (504) 765-2525

376-378	386	414	431	443-445
447-448	619	621	635	(24 samples)

You may calculate the RBC Folate results when you obtain the missing hematocrits by simply dividing the Whole Blood Folate by the hematocrit/100 (example: if hct=43%, divide by 0.43). The Whole Blood Folate results have already been corrected for the dilution factors.

Finally, there are two other samples which I cannot account for. Sample 342 has only a ferritin result; sample 252 has only ferritin, B12/Fol, Whole Blood Folate. We have been unable to locate these samples after the analyses to verify their identities. It is possible that they were samples which were misnumbered by us in recording the results or misread from the tubes when performing the assays. In any event I apologize for these mix-ups.

My suggestions for avoiding future problems include sending the tubes in a rack arranged in numerical order along with a coded list of the specimens and the tests to be done on each. In addition, the use of a specimen ID system which would not rub off easily when wet would help us identify the samples better.

In spite of these mix-ups, complete results were obtained on 72 samples; lipids, iron/TIBC were obtained on 221 samples; serum ferritin, B12/Folate results on 222 samples; complete results on serum in 221 samples; and whole blood folates were completed on 94 samples.

Please feel free to contact me about any of these results.

Best regards,

Richard Tulley

Richard Tulley, Ph.D.
Clin. Res. Lab Manager

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SA	FERRITI	VIT B12	SER FOLAT	WHOLE BL	HCT	RBC FOLATE	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	ng/ml	pg/ml	ng/ml	FOLATE, N	%		
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	22-447	232-1138	2.2-17.3	169-707			
SAMPLE #															
101	122	44	37	76	64	442	378	14.5	14.4	536	10.85		33.2		
102	186	63	49	124	59	284	225	20.8	34.4	608	12.83	154.8	42.8	361.7	
103	171	93	39	113	60	292	232	20.5	25.4	411	8.86		44.7		
104	163	56	48	104	60	367	307	16.3	6.7	427	5.27		41.4		
105	187	74	54	118	31	314	283	9.9	17.7	389	5.19		46.8		
106	138	86	38	83	71	286	215	24.8	16.5	329	7.12		45.4		
107	125	90	41	66	136	271	135	50.2	50.8	287	7.14	98.5	49.5	199.0	
108	163	87	36	110	97	313	216	31.0	175.8	587	5.62				
109	153	47	55	89	37	321	284	11.5	43.2	598	9.84		41.1		SLIGHLTLY HEMOLYZED
110	123	46	50	64	71	306	235	23.2	24.9	470	11.42	149.6	44.1	339.2	
111	121	64	69	39	47	296	249	15.9	60.3	393	4.52		47.5		
112	183	75	72	96	79	327	248	24.2	16.3	408	5.88		45.5		
113	177	134	53	97	10	383	373	2.6	3.9	386	9.46		33.6		
114	125	108	32	71	120	329	209	36.5	43.5	263	7.91		44.3		
115	164	97	36	109	36	332	296	10.8	8.9	587	3.09		38.0		
116	141	109	45	74	47	292	245	16.1	67.1	208	4.27	99.8	42.1	237.1	
117	141	85	42	82	43	344	301	12.5	21.7	322	6.92		47.2		
118	165	89	48	99	84	290	206	29.0	97.1	582	8.23	96.6	49.5	195.2	
119	200	116	38	139	33	411	378	8.0	7.0	451	8.21		41.1		
120	123	51	42	71	59	354	295	16.7	19.3	406	11.60		38.8		
121	167	60	57	98	39	387	348	10.1	6.5	304	4.38		39.8		
122	161	251	34	77	48	313	265	15.3	130.5	307	2.80		47.0		LIPEMIC
123	162	86	50	95	142	280	138	50.7	19.2	520	4.15		45.3		SLIGHTLY HEMOLYZED
124	165	67	79	73	81	344	263	23.5	13.9	409	5.30	133.6	40.1	333.2	
125	168	92	33	117	48	309	261	15.5	49.3	223	4.06	102.5	44.4	230.9	
126	153	186	34	82	48	336	288	14.3	8.9	416	7.70		42.2		LIPEMIC
127	121	73	36	70	65	283	218	23.0	59.2	406	4.03	75.8	38.8	195.4	
128	140	50	45	85	169	294	125	57.5	88.3	413	10.59		42.6		
129	114	54	47	56	80	328	248	24.4	23.2	710	19.84	203.1	42.9	473.4	
130	176	62	60	104	102	282	180	36.2	78.0	611	9.07		44.0		
131	118	82	40	62	73	305	232	23.9	81.1	369	10.02		39.8		
132	155	99	46	89	34	295	237	12.5	82.5	303	8.76	94.7	41.7	227.1	
133	74	69	23	37	49	271	222	18.1	19.3	344	5.02		39.8		
134	128	55	54	63	49	290	241	16.9	16.4	311	8.64		45.9		
201	104	42	45	51	31	297	266	10.4	8.0	547	11.10		37.8		
202	159	110	47	90	108	399	291	27.1	26.1	369	12.27	137.8	46.4	297.0	
203	175	78	59	100	96	328	232	29.3	25.0	429	7.46		45.5		
204	173	51	54	109	42	329	287	12.8	14.0	541	15.76		43.8		
205	183	86	44	122	91	326	235	27.9	28.8	333	11.18	130.5	44.5	293.1	
206	151	92	34	99	46	401	355	11.5	14.9	338	12.91		41.1		
207	156	63	67	76	35	349	314	10.0	29.8	382	6.05	87.6	38.0	230.5	
208	187	59	72	103	50	363	313	13.8	42.8	371	7.15	131.1	47.6	275.4	HEMOLYZED
209	152	64	45	94	37	359	322	10.3	15.7	503	5.17		41.6		

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SA	FERRITI	VIT B12'	SER FOLAT	WHOLE BL	HCT	RBC FOLATE	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	ng/ml	pg/ml	ng/ml	FOLATE, N	%		
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	22-447	232-1138	2.2-17.3	169-707			
SAMPLE #															
210	172	51	76	86	62	296	234	20.9	9.6	247	7.50	204.4	48.4	422.3	
210R	185	122	46	115	75	298	223	25.2	56.3	459	7.63				
211	158	92	39	101	55	327	272	16.8	23.0	407	13.02		38.6		
212	142	46	52	81	135	319	184	42.3	38.6	356	10.39		42.6		
213	209	148	49	130	85	325	240	26.2	86.9	384	9.78	116.4	46.3	251.4	
214	114	57	44	59	37	356	319	10.4	6.3	405	15.58	156.3	41.5	376.6	
215	171	116	46	102	41	307	266	13.4	25.2	575	16.11	212.8	44.5	478.2	
216	211	186	40	134	110	309	199	35.6	19.9	332	5.11	118.3	46.3	255.5	
217	164	63	48	103	46	337	291	13.6	11.4	503	12.90		41.7		
218	147	88	54	75	35	301	266	11.6	17.8	509	9.10	122.4	41.3	296.4	
219	141	80	40	85	121	318	197	38.1	19.4	439	3.80	84.1	48.6	173.0	
220	198	142	53	117	86	311	225	27.7	24.6	326	7.49	91.3	44.0	207.5	
221	193	161	33	128	54	349	295	15.5	26.1	391	5.88	118.1	43.0	274.7	
222	122	63	50	59	32	274	242	11.7	12.4	284	9.98	105.8	46.5	227.5	
223	155	62	37	106	33	359	326	9.2	51.0	509	11.73		44.6		
224	123	86	48	58	77	322	245	23.9	35.0	344	7.83		39.2		
225	176	90	51	107	72	343	271	21.0	31.6	220	8.00		41.6		
226	202	125	56	121	105	299	194	35.1	77.1	371	7.81	103.5	46.5	222.6	
227	136	81	36	84	62	318	256	19.5	44.7	1100	7.26		45.9		
228	182	56	59	112	95	329	234	28.9	16.4	421	5.81		43.9		
229	123	75	37	71	27	349	322	7.7	9.8	450	5.23		41.8		
230	136	98	37	79	94	391	297	24.0	7.9	359	9.78		44.9		
231	183	111	38	123	99	317	218	31.2	32.5	451	8.47	102.6	47.5	216.0	
232	162	67	44	105	112	326	214	34.4	10.7	510	13.06	144.9	43.9	330.1	
233	143	68	35	94	80	314	234	25.5	101.1	509	7.16		44.6		
234	206	55	93	102	42	332	290	12.7	11.7	561	8.18		37.3		
235	196	121	43	129	81	367	286	22.1	15.2	419	4.38	109.3	49.1	222.6	
252									18.5	246	8.96	109.3			
301	211	115	46	142	89	356	267	25.0	14.3	479	8.46	98.6	48.8	202.0	
302	130	44	50	71	62	303	241	20.5	39.6	732	13.31		41.2		
303	176	115	45	108	100	369	269	27.1	46.4	489	12.05		46.9		
304	150	79	51	83	98	278	180	35.3	27.4	382	5.48	95.8	44.2	216.7	
305	178	45	72	97	52	320	268	16.3	75.6	539	4.54		43.9		
306	141	58	64	65	54	323	269	16.7	21.7	556	11.82		38.5		
307	134	53	53	70	27	299	272	9.0	19.2	664	8.23	105.4	41.4	254.6	
308	172	62	72	88	38	362	324	10.5	10.7	596	17.15		38.6		
309	145	52	40	95	71	348	277	20.4	46.0	392	9.33	144.4	45.9	314.6	
310	156	91	44	94	45	351	306	12.8	13.8	525	7.79	117.5	43.9	267.7	
311	99	55	41	47	78	222	144	35.1	100.1	382	6.09		43.8		
312	120	47	56	55	81	309	228	26.2	20.4	415	8.17		45.0		
313	183	109	32	129	48	309	261	15.5	33.6	378	10.69	143.4	45.7	313.8	
314	192	99	46	126	54	336	282	16.1	14.8	490	10.41		42.8		SL. HEMOLYZED,LIPEMIC
315	106	50	58	38	54	361	307	15.0	9.4	483	8.39		43.4		

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SA	FERRITI	VIT B12	SER FOLAT	WHOLE BL	HCT	RBC FOLATE	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	ng/ml	pg/ml	ng/ml	FOLATE, N	%		
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	22-447	232-1138	2.2-17.3	169-707			
SAMPLE #															
316	148	56	56	81	33	279	246	11.8	10.3	991	20.58		45.4		
317	161	55	52	98	68	257	189	26.5	72.0	500	10.42		43.1		
318	135	129	42	67	54	352	298	15.3	56.9	483	10.29	143.2	45.2	316.8	
319	170	66	52	105	46	341	295	13.5	7.9	267	5.66		40.5		
320	160	56	53	96	35	407	372	8.6	6.3	556	6.50		40.0		
321	168	57	44	113	54	296	242	18.2	97.8	217	5.50	107.1	44.6	240.1	
322	161	94	60	82	49	314	265	15.6	19.9	502	7.19	89.7	46.4	193.3	
323	134	54	56	67	90	371	281	24.3	45.7	696	5.91		47.8		
324	244	83	46	181	153	328	175	46.6	17.0	613	22.05		41.2		
325	129	67	41	75	74	314	240	23.6	38.7	364	4.82		44.1		
326	154	97	42	93	36	285	249	12.6	125.1	631	8.78	99.8	43.2	231.0	
327	178	75	47	116	82	267	185	30.7	20.2	542	7.54		39.3		
328	174	82	64	94	68	366	298	18.6	13.8	739	12.43	160.3	43.3	370.2	
330	145	59	63	70	33	260	227	12.7	8.9	351	13.09		33.1		
332	163	112	48	93	48	337	289	14.2	19.5	399	6.60		41.4		
333	150	81	42	92	112	253	141	44.3	54.8	287	6.11		43.9		
334												100.2			
335	142	83	40	85	36	305	269	11.8	11.9	422	4.39		40.2		
336	124	65	44	67	47	247	200	19.0	26.0	572	10.14	121.7	42.4	287.0	
337	165	94	44	102	26	277	251	9.4	51.9	399	4.78		44.9		
339												128.1			
340												159.7			
342									14.4						
343	153	40	51	94	113	338	225	33.4	18.2	352	5.32	134.3	42.6	315.3	
346	236	136	47	162	114	326	212	35.0	33.2	202	5.57		47.7		
347	181	68	47	120	25	294	269	8.5	1.9	520	8.92	101.8			
348	140	51	47	83	89	322	233	27.6	21.4	799	10.39		43.4		
349	144	181	34	74	65	276	211	23.6	20.0	485	20.02	211.9	45.2	468.8	SLIGHTLY LIPEMIC
351	165	119	44	97	173	294	121	58.8	58.6	605	6.90		48.4		
357												106.4			
358	147	51	54	83	120	400	280	30.0	7.3	210	8.39		35.0		
359	147	50	53	84	45	382	337	11.8	10.7	415	8.10		41.9		SLIGHTLY HEMOLYZED
360	200	115	56	121	68	356	288	19.1	44.2	305	8.46		46.1		
362												94.0			
363	127	46	56	62	65	294	229	22.1	15.0	368	9.71		43.2		
364												108.3	49.0	221.0	
365	107	59	59	36	87	295	208	29.5	17.0	479	11.30				
366	154	61	51	91	23	516	493	4.5	7.8	590	8.98		33.1		
367												139.9			
368	148	65	58	77	27	440	413	6.1	6.3	380	9.36		36.2		
370												140.6			
371	140	46	48	83	22	286	264	7.7	16.7	434	10.13		38.2		
372	137	56	41	85	35	459	424	7.6	6.7	300	10.30		38.8		

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SA	FERRITI	VIT B12	SER FOLAT	WHOLE BL	HCT	RBC FOLATE	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	ng/ml	pg/ml	ng/ml	FOLATE, N	%		
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	22-447	232-1138	2.2-17.3	169-707			
SAMPLE #															
373												167.2			
375	187	92	63	106	98	342	244	28.7	54.8	343	12.10	154.5	43.3	356.8	
376												133.8			
378												124.6			
380	121	49	48	63	84	353	269	23.8	15.2	361	7.56		43.7		
381	176	71	56	106	61	289	228	21.1	25.9	468	13.67		44.4		
382	173	82	50	107	100	275	175	36.4	41.3	499	10.31	121.2	42.3	286.5	
383	134	36	58	69	66	310	244	21.3	29.0	512	11.48		36.9		
384	202	126	44	133	51	312	261	16.3	16.5	554	8.47		43.1		SLIGHTLY LIPEMIC
386												104.1			
389	138	136	54	57	53	335	282	15.8	29.8	352	19.81		37.7		
401	140	95	44	77	19	369	350	5.1	5.0	639	11.91	108.8	39.0	279.0	
402	177	60	62	103	50	301	251	16.6	10.6	528	17.45		37.4		
403	142	58	48	82	94	375	281	25.1	7.1	358	12.52		36.1		
404	134	70	38	82	59	340	281	17.4	6.3	317	5.22		34.4		
405	200	90	57	125	44	382	338	11.5	25.1	521	17.17		34.2		
406	172	87	54	101	96	327	231	29.4	24.7	240	4.55		36.6		
407	179	73	68	95	184	315	131	58.4	19.8	775	7.31		38.6		
408	161	73	45	101	37	293	256	12.6	16.0	380	4.78		36.1		
409	186	71	54	118	66	338	272	19.5	40.0	279	5.91		36.5		
411	200	78	67	117	69	354	285	19.5	26.1	518	15.58	139.4	38.9	358.4	HEMOLYZED
412	144	72	66	64	77	285	208	27.0	30.7	580	8.50	116.7	38.9	300.0	
413	191	52	75	106	53	344	291	15.4	7.2	390	12.33	111.2	32.1	346.4	
414	118	74	40	63	78	333	255	23.4	32.3	356	5.24				
415	165	67	56	96	9	390	381	2.3	2.6	193	9.96		30.2		
416	185	79	87	82	10	347	337	2.9	6.7	325	7.89	104.4	32.8	318.3	
417	170	68	62	94	23	390	367	5.9	3.8	296	10.08		32.9		
418	149	66	52	84	18	401	383	4.5	5.3	432	10.63		36.7		
419	212	71	65	133	30	317	287	9.5	6.7	260	3.77	53.9	36.8	146.5	
420	143	55	56	76	70	354	284	19.8	15.1	692	8.54	97.5	39.3	248.1	
421	208	87	72	119	34	396	362	8.6	6.8	324	14.97		36.2		
422	129	52	46	73	41	305	264	13.4	14.8	287	17.19		37.1		
423	127	48	57	60	95	361	266	26.3	20.2	312	19.42		37.7		
424	168	94	40	109	43	359	316	12.0	10.1	587	11.61		41.2		
425	162	68	51	97	25	357	332	7.0	5.5	343	14.77		36.1		
426	138	75	54	69	52	350	298	14.9	12.1	289	8.88		38.4		
427	176	58	61	103	62	376	314	16.5	18.5	915	12.71		31.9		
428	149	69	74	61	20	282	262	7.1	8.3	466	7.61		41.5		
429	219	125	65	129	83	308	225	26.9	19.6	589	20.68		38.7		
430	195	169	45	116	54	299	245	18.1	32.5	811	22.73	150.1	38.6	388.9	
431	158	74	94	49	58	420	362	13.8	5.8	296	11.32				
432	191	77	69	107	28	557	529	5.0	3.7	204	6.65		37.3		
433	184	70	62	108	37	335	298	11.0	7.3	425	10.90		35.8		

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SA	FERRITI	VIT B12	SER FOLAT	WHOLE BL	HCT	RBC FOLATE	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	ng/ml	pg/ml	ng/ml	FOLATE, N	%		
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	22-447	232-1138	2.2-17.3	169-707			
SAMPLE #															
435	143	68	73	56	113	328	215	34.5	18.0	663	24.28	143.7	38.6	372.3	
436	177	60	65	100	42	390	348	10.8	10.2	185	14.28		32.6		
438	174	82	53	105	102	322	220	31.7	25.7	447	11.09		36.1		
439	160	65	41	106	92	266	174	34.6	8.7	340	10.62		36.1		
440	193	71	63	116	32	441	409	7.3	4.8	261	5.83	96.6	34.8	277.6	
443												123.0			
445												163.1			
446	150	96	47	84	90	386	296	23.3	10.3	644	24.66	218.5	40.3	542.2	
447												150.1			
448												152.3			
449												105.0	39.3	267.2	
450	157	61	74	71	34	317	283	10.7	8.7	385	12.89	127.6	33.1	385.5	
501	173	87	50	106	94	324	230	29.0	18.1	396	8.91		46.0		
504	184	83	85	82	29	374	345	7.8	5.5	358	9.59	106.6	35.9	296.9	
505	160	48	53	97	24	393	369	6.1	2.3	493	9.58		30.0		
506	188	58	70	106	161	340	179	47.4	21.8	365	12.03	103.9	40.8	254.7	
507	171	43	79	83	72	523	451	13.8	6.4	565	33.48		29.9		
508	166	57	66	89	97	365	268	26.6	13.0	226	7.38		35.0		
509	175	76	75	85	31	407	376	7.6	7.1	374	5.63	77.8	35.2	221.0	
510	184	53	49	124	129	321	192	40.2	22.9	413	7.52		43.5		
511	129	63	52	64	65	374	309	17.4	16.5	373	5.39	88.1	37.4	235.6	
512	132	47	61	62	44	308	264	14.3	13.9	548	17.72		34.5		
513	128	206	52	35	40	353	313	11.3	33.9	401	4.30	111.2	35.9	309.7	
514	140	44	68	63	239	358	119	66.8	15.8	448	29.10		37.1		
515	158	60	51	95	128	289	161	44.3	21.1	404	12.56		36.0		
516	113	36	48	58	57	245	188	23.3	10.0	274	4.17	108.6	38.0	285.8	
517	162	76	47	100	78	435	357	17.9	8.4	588	9.48	150.3	39.0	385.4	
518	151	41	54	89	25	416	391	6.0	5.2	337	5.50	54.3	34.6	156.9	
519	143	71	42	87	93	255	162	36.5	19.5	359	3.81		37.3		
527	154	60	50	92	107	271	164	39.5	33.8	698	6.09		40.6		
533	187	62	70	105	35	318	283	11.0	11.6	780	15.74		37.6		
571	153	69	54	85	61	265	204	23.0	35.6	758	5.51		40.2		
601	190	106	46	123	62	291	229	21.3	14.4	248	5.18		34.8		
602	201	43	65	127	34	375	341	9.1	5.7	491	7.94		42.2		
603	221	85	61	143	97	329	232	29.5	21.8	373	13.43		34.7		
604	185	71	53	118	37	359	322	10.3	7.4	240	8.21		34.5		
605	167	56	55	101	117	263	146	44.5	23.1	514	18.99	138.9	32.4	428.7	
606	150	74	44	91	25	391	366	6.4	7.1	341	5.17	79.1	35.0	226.0	
607	152	84	52	83	62	342	280	18.1	11.2	284	8.38		36.9		
608	191	65	58	120	19	406	387	4.7	6.7	431	9.00		34.5		
609	163	79	57	90	35	359	324	9.7	5.0	547	8.67	113.4	38.6	293.8	
610	152	61	42	98	41	322	281	12.7	6.9	526	7.04		43.2		
611	148	52	50	88	71	400	329	17.8	5.4	806	11.43		41.0		

PENNINGTON BIOMEDICAL RESEARCH CENTER

TEST	CHOL	TRIG	HDL	LDL	IRON	TIBC	UIBC	IRON SA	FERRITI	VIT B12	SER FOLAT	WHOLE BL	HCT	RBC FOLATE	SAMPLE COMMENTS
units	mg/dl	mg/dl	mg/dl	mg/dl	ug/dl	ug/dl	ug/dl	%	ng/ml	pg/ml	ng/ml	FOLATE, N	%		
NORMALS	140-200	35-160	27-67	65-175	50-160	250-400	200-240	20-55	22-447	232-1138	2.2-17.3	169-707			
SAMPLE #															
612	153	77	46	92	16	443	427	3.6	3.7	366	7.19	74.9	33.1	226.3	
613	124	39	44	72	118	264	146	44.7	27.6	551	8.58		38.9		HEMOLYZED
614	179	50	80	89	80	319	239	25.1	7.6	252	8.00	87.3	38.7	225.6	
615	153	61	54	87	21	343	322	6.1	7.4	241	9.09		32.9		
616	139	52	52	77	95	352	257	27.0	31.7	392	11.14		35.8		
617	181	58	86	83	201	349	148	57.6	16.8	376	16.39		37.2		
618	191	60	78	101	98	353	255	27.8	11.7	450	9.03		41.1		
619	172	67	91	68	60	275	215	21.8	24.2	365	9.83				
620	139	48	60	69	61	311	250	19.6	3.2	490	9.15		36.8		
621	141	35	59	75	28	337	309	8.3	13.3	320	10.16				
622	150	87	42	91	158	311	153	50.8	35.1	411	6.62		42.5		
623	178	67	54	111	101	353	252	28.6	5.8	341	13.09	190.1	35.4	537.0	
624	138	75	66	57	29	382	353	7.6	4.3	176	11.50		36.5		
625	158	105	55	82	21	344	323	6.1	12.7	666	12.63		38.7		
626	138	111	64	52	40	349	309	11.5	7.2	276	13.37	134.8	37.0	364.3	
627	214	82	47	151	21	428	407	4.9	4.3	374	4.16		40.0		
628	121	44	56	56	44	275	231	16.0	56.0	297	5.95	88.6	36.2	244.8	
629	127	44	61	57	19	445	426	4.3	6.5	379	8.78	96.2	35.1	274.1	
630	137	52	68	59	39	322	283	12.1	5.5	378	7.17	75.7	38.7	195.6	
631	149	131	40	83	36	403	367	8.9	12.2	399	7.70		42.6		
632	132	70	51	67	74	250	176	29.6	36.5	398	5.97		33.4		
633	168	96	56	93	46	394	348	11.7	5.4	705	10.10		35.5		
634	202	57	60	131	33	340	307	9.7	6.6	472	6.04		37.5		
635												142.8			
702	167	77	55	97	80	268	188	29.9	11.3	570	6.10		39.9		
801	170	73	60	95	58	319	261	18.2	70.0	745	8.91		45.5		

APPENDIX II

ANNUAL REPORT

AUGUST 1990

ATTACHMENT

REPRINTS AND ABSTRACTS

1. Prasad C, Ragan FA, Hilton CW: Isolation of CYCLO(HIS-PRO)-like immunoreactivity from human urine and demonstration of its immunologic, pharmacologic, and physico-chemical identity with the synthetic peptide. Biochemistry international (in press).

2. Prasad C and Spahn SA: One-year continuous low-dose Nicotine intake does not alter body weight of rats. Int. j. Vit., Nutr. Res. 59: 413-416, 1989

3. Farooqui SM, Brock JW, Hamdi A and Prasad C: Synthetic peptides predicted from the amino acid sequence of D2 dopamine receptor exhibit antibodies reactive with native dopamine receptor protein in rat brain. Prepared manuscript. (not included in appendix)

4. Onaivi ES, Brock JW and Prasad C: High-Protein diet modulates dopamine-and non-dopamine mediated behaviors. Prepared manuscript. (not included in appendix)

5. Onaivi ES, Brock JW, Hamdi A and Prasad C: High-protein diet modulates dopamine and non-dopamine mediated behaviors in rats. To be presented at the Society for Neuroscience meeting, 1990.

6. Brock JW, Farooqui SM and Prasad C: Dopamine type D2 receptor-specific antibodies. To be presented at the Society for Neuroscience meeting, 1990.

7. Chuang CZ, Ragan FA and Prasad C: Optimization of conditions for seperation of ten tryptophan metabolites by RP-HPLC. To be presented at the Society for Neuroscience meeting, 1990.

8. Prasad C: Cyclic dipeptides and neuronal function. To be presented at the symposium on Endocrine and Nutritional control of basic biological functions, 1990.

9. Onaivi ES, Talton S and Prasad C: Level of protein in diet modulates the behavioral effects of amphetamine. To be presented at the symposium on Endocrine and Nutritional control of basic biological functions, 1990.

10. Hilton CW, Prasad C and Reddy S: Identification of a potentially bioactive peptide, [CYCL(HIS-PRO)], in some nutritional supplements. A Clinical research abstract, 1990.

11. Hilton CW, Prasad C and Wilber JF: Acute alterations of CYCL(HIS-PRO) levels after oral ingestion of glucose. Neuropeptides, 15:55-59, 1990.

12. Ikegami H, Spahn SA and Prasad C: Effect of chronic nicotine consumption on body weight, food intake, and striatal dopaminergic neurons in rats. Nutrition Research, 9: 635-643, 1990

13. Ikegami H and Prasad C: Neuropeptide-dopamine interactions. V. CYCL(HIS-PRO) regulation of striatal dopamine transporter complex. Peptides, 11: 145-148, 1990.

14. Chuang CZ, Ragan FA and Prasad C: Optimization of condions for the simultaneous seperation of ten tryptophan metabolites using reversed - phase high - performance liquid chromatography. J. Chromatography. Biomedical Applications (In press).

Fort Polk Heart Smart Project

Annual Report

August, 1990

Attachment

Tables 1-11

FORT POLK HEART STUDY

FORT POLK, LOUISIANA

5TH MECHANIZED DIVISION

15,000 Active Duty Personnel

10,000 Personnel With Depdenents

6,000 Child Dependents

FORT POLK HEART STUDY

Project 1 - Baseline Assessment of Dietary Intake and Physical Activity in Military Dependents

Sample - 200 Wives of Military Personnel With At Least 1 Child

Goals - Characterize Eating, Food Purchasing, and Physical Activity Patterns

Measures

1. 24-Hour Dietary Recall
2. Food Purchasing Questionnaire
3. Pantry Survey
4. Physical Activity Recall
5. Health Habits Questionnaire
6. CVD Risk Factor Screening

Places Where Families Usually Purchase Most of Its Groceries

Places	1st Choice	2nd Choice	3rd Choice
Commissary	79	14	4
Discount Food Mart	23	61	10
Supermarket	5	29	40
Shopette	2	26	32
Other	11	27	32

Restaurants Families Go To Most Often (n=175)

	n	(%)
Bonanza	86	(49)
McDonald's	57	(33)
Burger King	42	(24)
Pizza Hut	24	(14)
Popeye's	24	(14)

MEAN LEVELS OF CARDIOVASCULAR DISEASE RISK FACTOR LEVELS

IN WIVES OF U.S. ARMY SERVICEMEN BY RACE

	White (n=95)		Black (n=26)		Hispanic (n=15)		Asian (n=6)	
Variable	$\bar{x}$	(±S.D.)	$\bar{x}$	(±S.D.)	$\bar{x}$	(±S.D.)	$\bar{x}$	(±S.D.)
Height (cm)	163.6	(6.0)	163.6	(4.8)	158.3	(4.8)	161.2	(2.7)
Weight (kg)	68.8	(15.8)	72.1	(15.4)	66.8	(13.1)	67.4	(12.9)
Body Mass Index*	75.1	(5.8)	26.9	(5.6)	26.6	(4.8)	27.0	(4.3)
Systolic Blood Pressure (mm Hg)	106.7	(25.7)	104.6	(8.6)	105.0	(6.0)	102.6	(7.8)
Diastolic Blood Pressure (mm Hg)	69.8	(12.5)	73.3	(26.0)	68.1	(6.0)	68.7	(2.3)
Cholesterol (mg/dl)	179.4	(31.6)	175.8	(33.5)	173.5	(37.7)	185.1	(70.1)
High Density Lipoprotein (mg/dl)	50.6	(10.8)	56.4	(10.9)	46.5	(12.5)	56.4	(7.3)

*Wt/Ht^2

Data as of 8/90

Occurence of Elevated Lipid Values
In Wives of U.S. Army Servicemen
Undergoing CV Risk Factor Screening
At Fort Polk, Louisiana
(N=187)

	N	(%)
Elevated Low Density Lipoprotein		
>160 mg/dl	17	(9)
>130 mg/dl	38	(20)
Elevated Very Low Density Lipoprotein (as indicated by physician's flag note)	5	(3)
Elevated Triglyceride		
>190 mg/dl	9	(5)

PHYSICAL ACTIVITY PATTERNS OF WIVES OF U.S. ARMY SERVICEMEN BY RACE,

WEEKLY FREQUENCIES, BY ACTIVITY TYPE

	Whites (n=133)		Blacks (n=37)		Hispanic (n=22)		Asian (n=9)	
Activity Type	Frequency	(%)	Frequency	(%)	Frequency	(%)	Frequency	(%)
Jogging	20	(15)	9	(24.3)	5	(22.7)	1	(11.1)
Cycling	31	(23.5)	8	(21.6)	7	(31.8)	1	(11.1)
Swimming	28	(20.9)	2	(5.4)	9	(40.9)	2	(22.2)
Aerobics	33	(25.0)	16	(43.2)	7	(31.8)	1	(11.1)
Aerobic Dance	26	(19.5)	14	(37.8)	6	(27.3)	3	(33.3)
Calisthenics	23	(17.6)	8	(22.2)	3	(13.6)	1	(33.3)

FORT POLK HEART STUDY

Project 2 - Cardiovascular Risk Assessment of Families at Fort Polk

Sample - 100+ Complete Families of Fort Polk Personnel

Goals - Establish Norms for CVD Risk Factors

Measures

1. Blood Pressure
2. Blood Lipids
3. Anthropometry
4. Medical History Questionnaire
5. Health Habits Questionnaire

Occurence of Elevated Lipid Values In Members of Military Families Undergoing CV Risk Factor Screening At Fort Polk, Louisiana (N=200)

	N	(%)
Elevated Low Density Lipoprotein		
>160 mg/dl	20	(10)
>130 mg/dl	48	(24)
Elevated Very Low Density Lipoprotein (as indicated by physician's flag note)	5	(2.5)
Elevated Triglyceride		
>190 mg/dl	12	(6)

FORT POLK HEART STUDY

Project 3 - Family Health Promotion

Sample - 60 Complete Families of Fort Polk Personnel

Goals - Develop a Heart Health Education Model For Military Families

Measures and Procedures

1. CVD Risk Factor Screening
2. Eating, Physical Activity, and Behavior Modification Counseling
3. Health Habits Questionnaire

NEWSLETTER

June, 1990

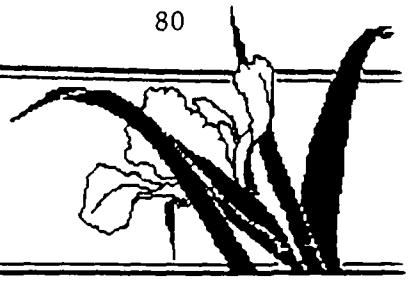
WELCOME TO FT. POLK HEART SMART

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5 5:30-8:30 pm Orientation Exercise	6	7	8	9
0	11	12 Week of CV Risk Factor Screening By Appointment	13	14	15	16
7	18	19 Counseling: CV Screening Feedback Dietary Assessment	20	21	22	23
4	25	26 6:30-8:00 pm Why Diet & Exercise? Snacking Exercise Relaxation	27	28 Walking Aerobics Swimming	29	30 Walking Aerobics Swimming

YOU AND YOUR FAMILY ARE ON THE WAY TO A MORE

HEALTHFUL WAY OF LIVING.. CONGRATULATIONS!

July, 1990
Ft. Polk Heart Smart
Family Health Promotion



Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 Walking Aerobics Swimming	3	4	5 Walking Aerobics Swimming	6	7
8	9 Walking Aerobics Swimming	10 10:30-12:00 N Label Reading Intro. to Walking Program	11	12 Walking Aerobics Swimming	13	14
15	16 Walking Aerobics Swimming	17 6:30-8:00 pm Label Reading/ Phys. Act. & Heart Dis.	18	19 Walking Aerobics Swimming	20	21
22	23 Walking Aerobics Swimming	24 10:30-12:00 N Food Purchasing Exercise/ Relaxation	25	26 Walking Aerobics Swimming	27	28
29	30	31 6:30-8:00 pm Going up in SMOKE! Empowerment Exercise/ Relaxation				

YOU'RE ON YOUR WAY.

KEEP UP THE GOOD WORK!

August, 1990

Ft. Polk Heart Smart
Family Health Promotion Program

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2 Walking Aerobics Swimming	3	4
5	6 Walking Aerobics Swimming	7 10:30-12:00 N Food Preparation/ Recipe Modification Exercise/ Relaxation	8	9 Walking Aerobics Swimming	10	11
12	13 Walking Aerobics Swimming	14 6:30-8:00 pm Recipe Modification Exercise/ Relaxation	15	16 Walking Aerobics Swimming	17	18
19	20 Walking Aerobics Swimming	21 10:30-12:00 N Dining Out Exercise/ Relaxation	22	23 Walking Aerobics Swimming	24	25
26	27 Walking Aerobics Swimming	28 6:30-8:00 pm Dining Out Exercise/ Relaxation	29	30 Walking Aerobics Swimming	31	

HEART SMART TEAM IS REALLY GREAT!

GET THAT FAT RIGHT OFF YOUR PLATE.

Fort Polk Heart Smart Project

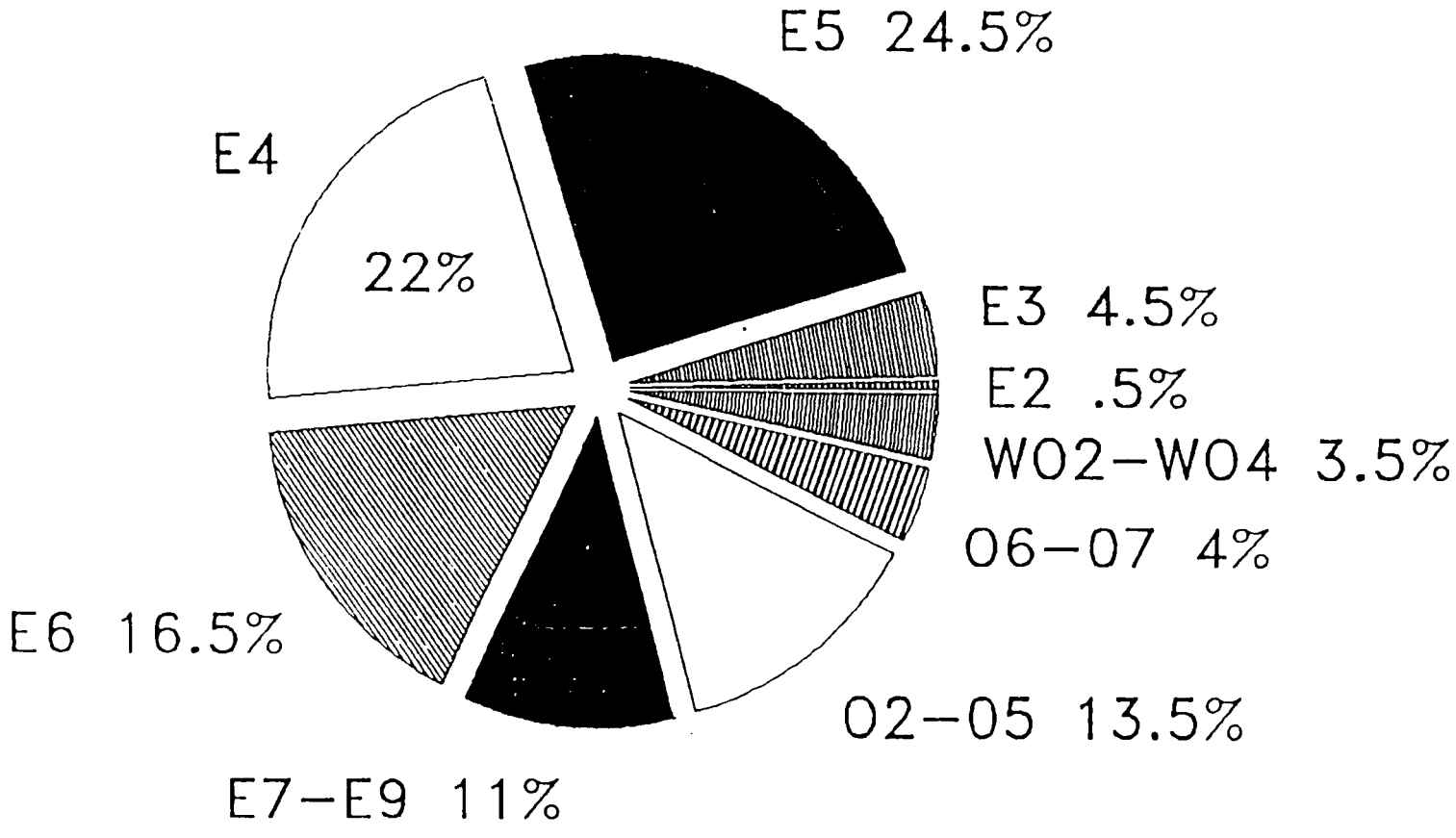
Annual Report

August, 1990

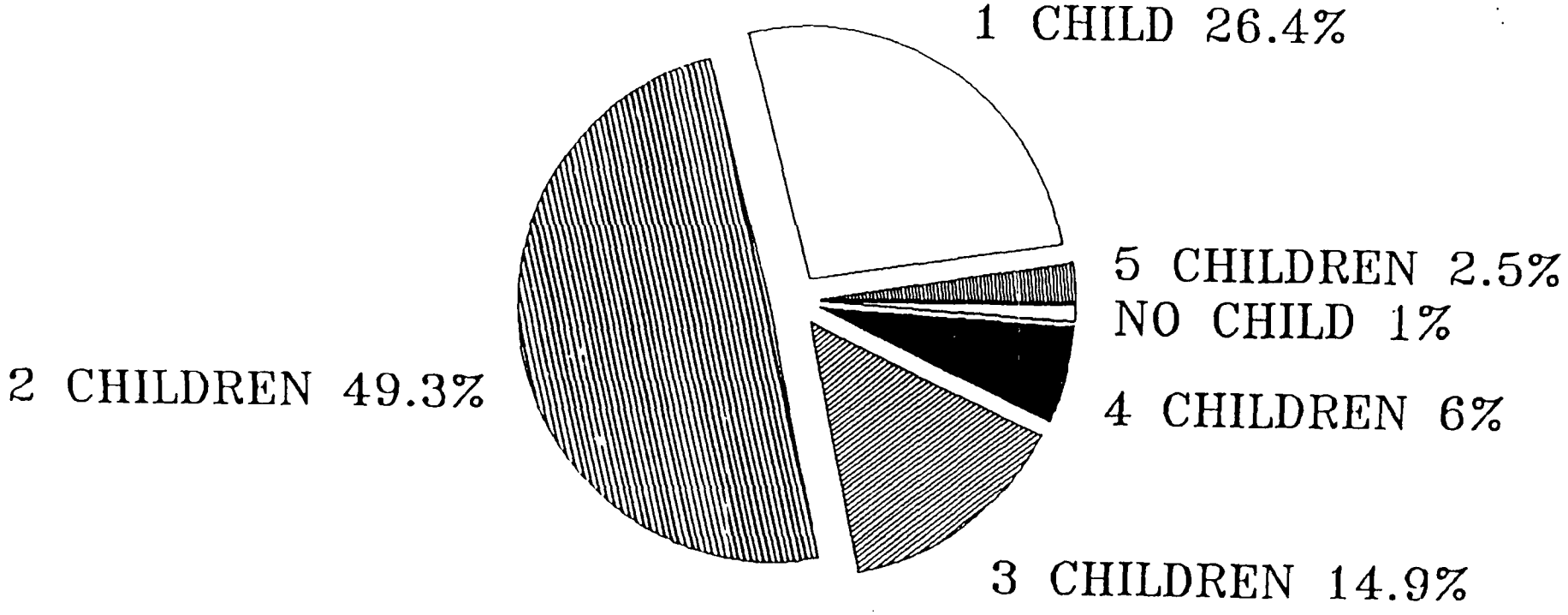
Attachment

Figures 1-8

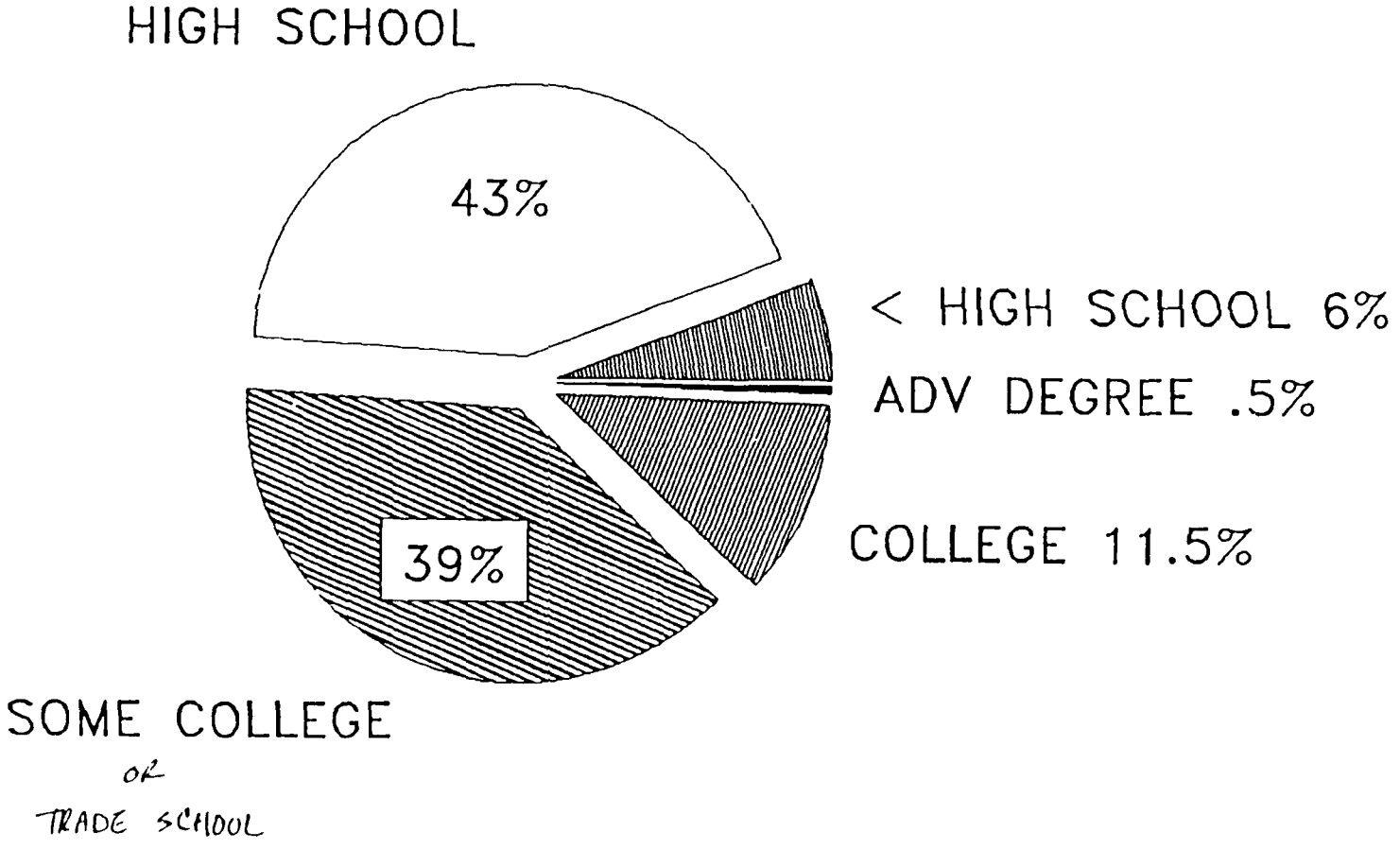
RANKS OF HUSBANDS
THE FORT POLK HEART SMART PROJECT



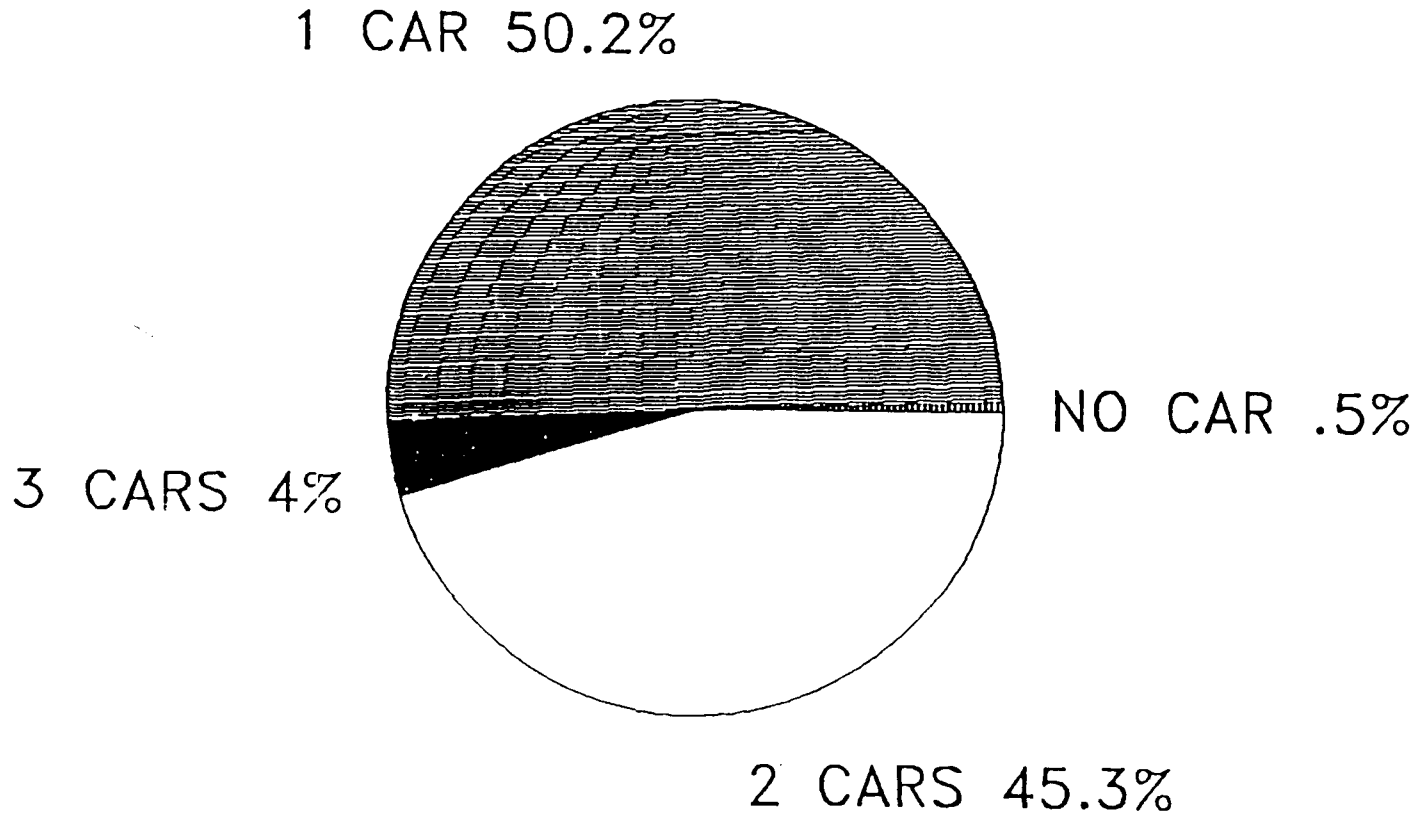
NUMBER OF CHILDREN PER FAMILY
THE FORT POLK HEART SMART PROJECT



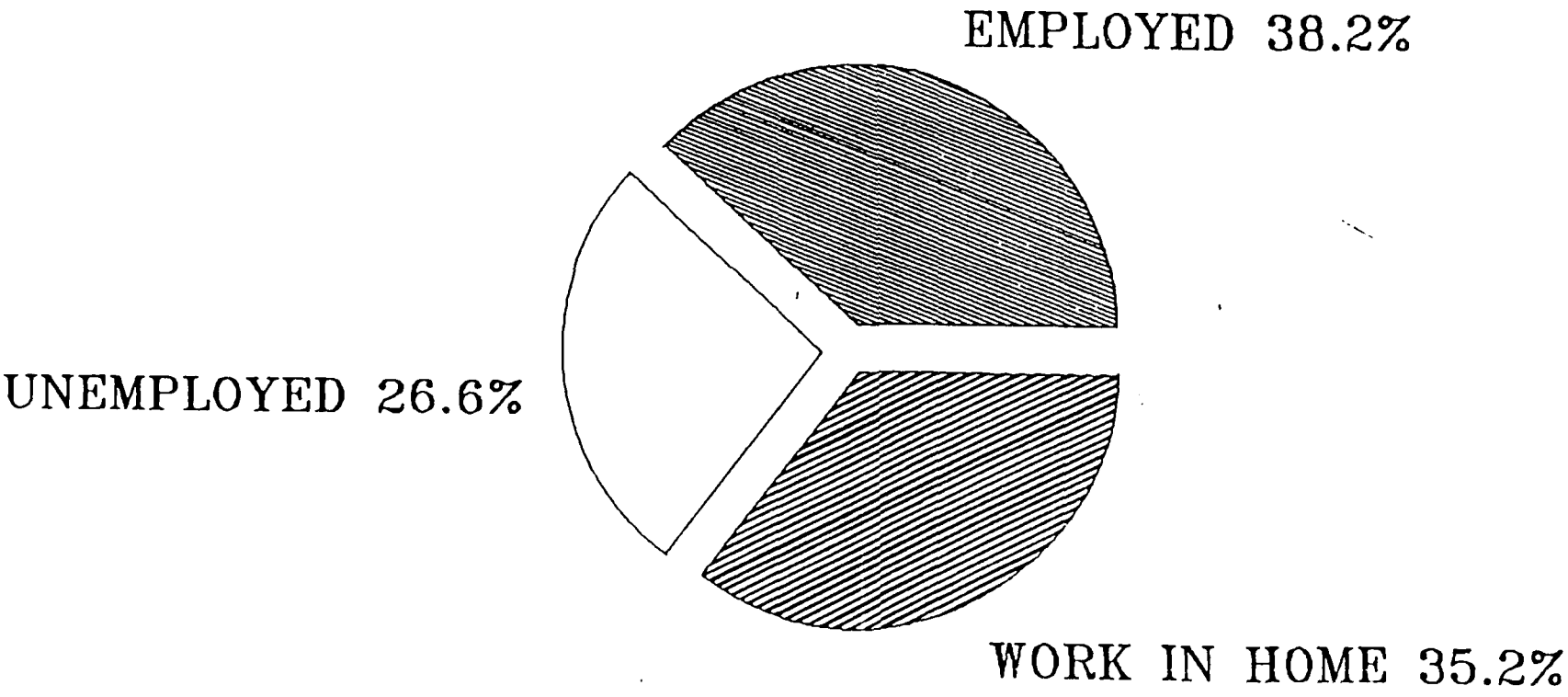
EDUCATIONAL STATUS OF SPOUSES
THE FORT POLK HEART SMART PROJECT



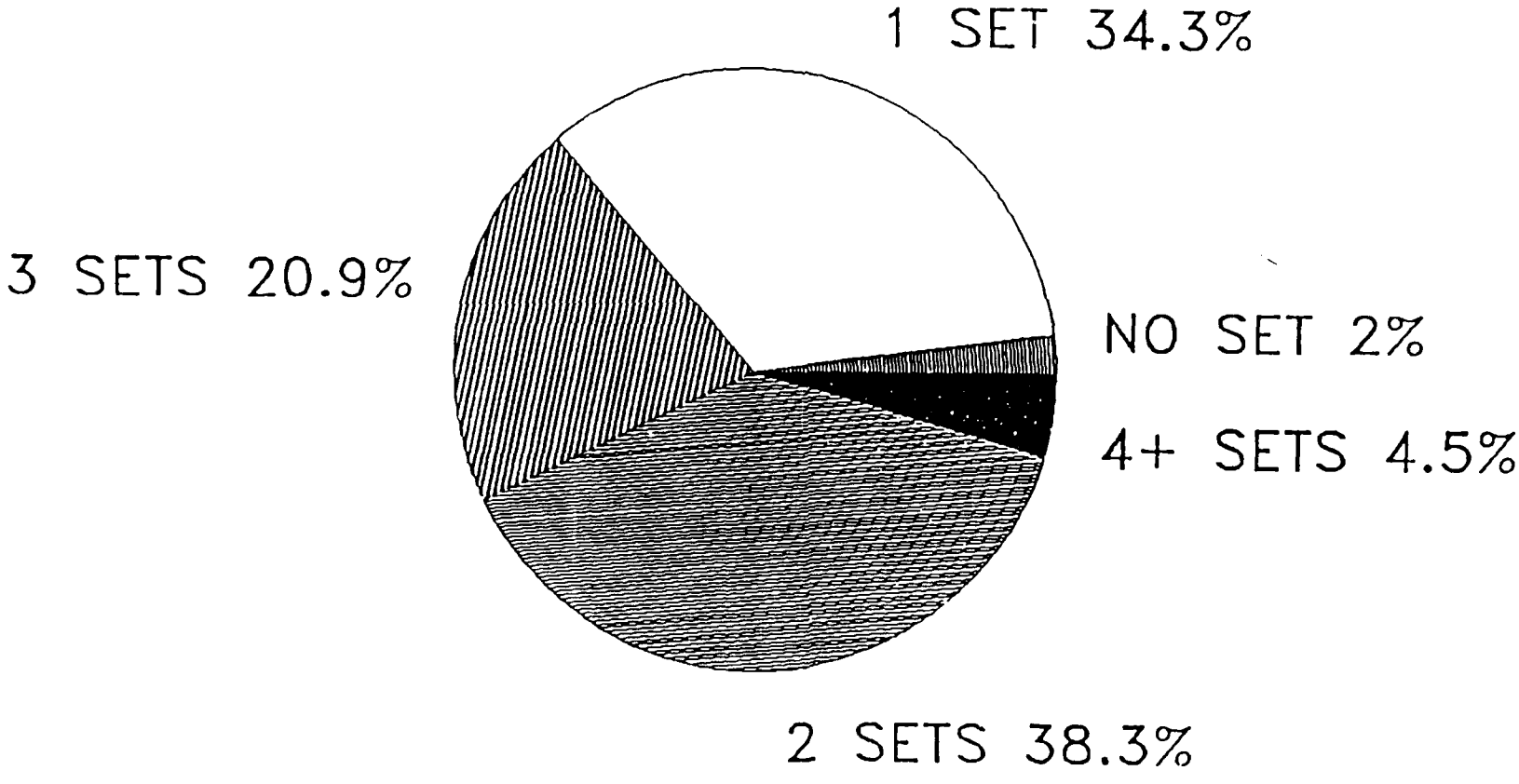
NUMBER OF CARS PER HOUSEHOLD
THE FORT POLK HEART SMART PROJECT



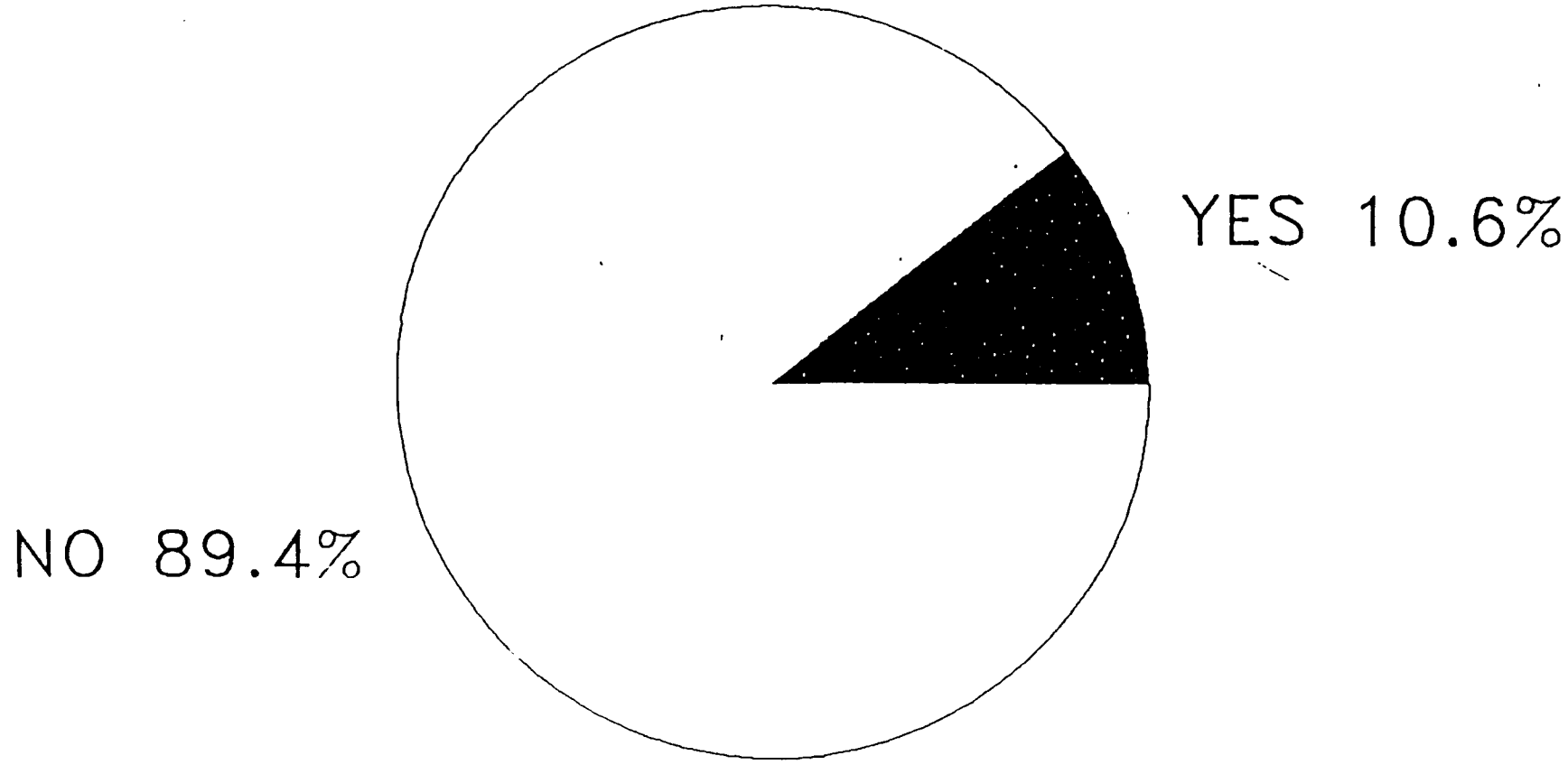
EMPLOYMENT STATUS OF SPOUSES
THE FORT POLK HEART SMART PROJECT



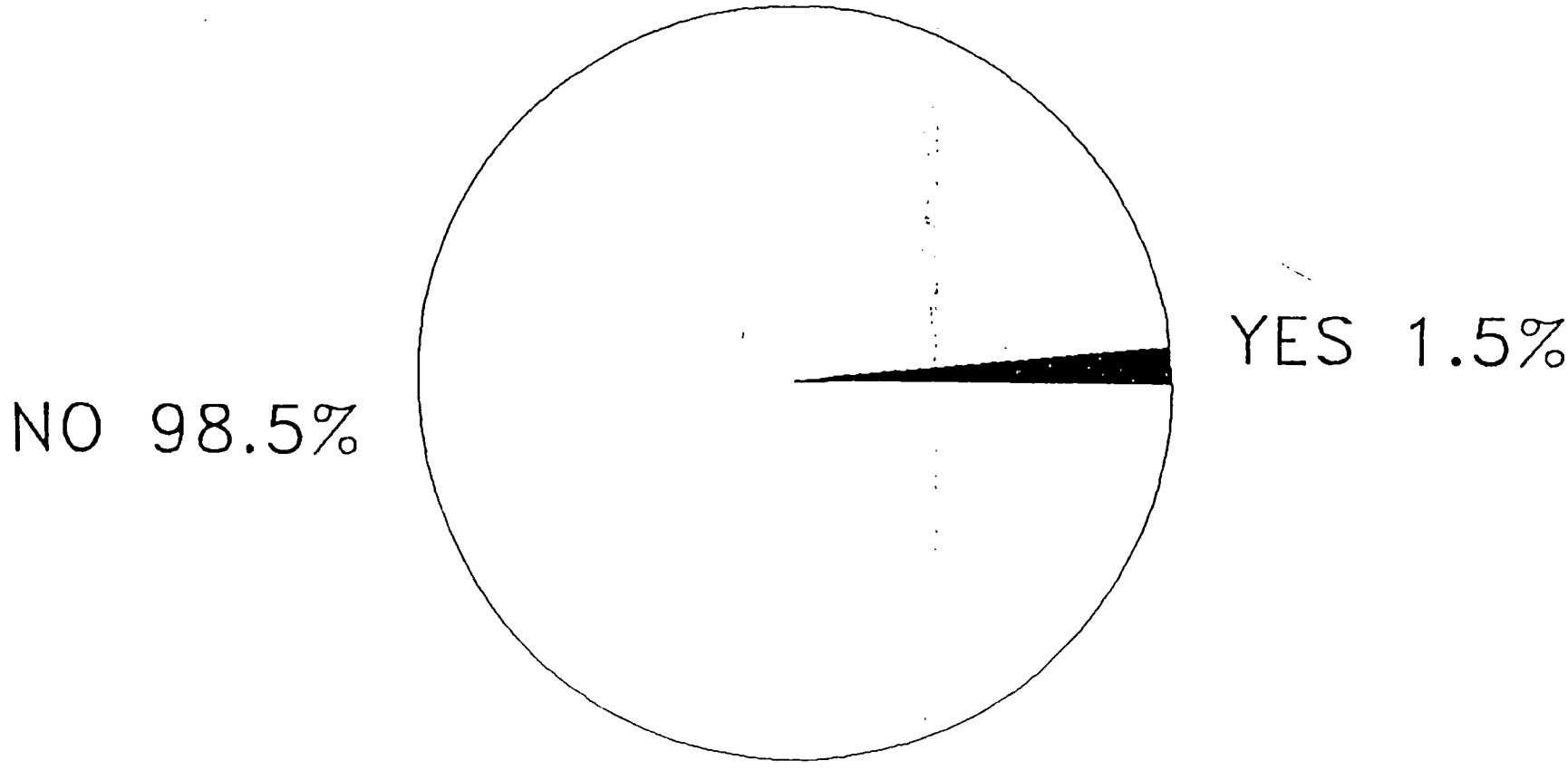
NUMBER OF TV SETS PER HOUSEHOLD
THE FORT POLK HEART SMART PROJECT



FAMILIES DEPENDENT ON WIC VOUCHERS
THE FORT POLK HEART SMART PROJECT



FAMILIES DEPENDENT ON FOOD STAMPS
THE FORT POLK HEART SMART PROJECT



ENTREES

MENU ITEM	TASTE PANEL SCORES				
	APPEARANCE	FLAVOR	TEXTURE	AROMA	OVERALL
1. Chicken Divan Casserole	7.13	7.50	7.38	6.86	7.22
2. Italian Beef Sandwich	8.33	8.33	8.00	7.56	8.06
Italian Beef Pie	7.50	8.50	7.83	7.67	7.88
3. Seafood Risotto	7.00	7.17	6.17	6.67	6.75
4. Pork and Rice Casserole	6.25	6.00	7.00	6.00	6.31
5. Stuffed Green Peppers	8.13	7.50	8.00	7.86	7.87
6. Stir Fried Pork	7.88	7.75	7.63	7.38	7.66
7. Catfish Parmesan	7.67	7.17	6.33	6.50	6.92
8. Turkey Creole/Mushrooms	6.63	7.50	7.00	7.00	7.01
9. Puffy Broiled Fish	6.86	7.00	6.43	7.33	6.91
10. Hawaiian Ham	7.13	7.63	7.63	7.13	7.38
11. Spiced Mustard Fish	8.00	7.63	7.50	7.25	7.60
12. Beef Porcupines	7.83	8.17	8.00	7.17	7.79
13. Texas Chicken/Dumplings	6.89	7.78	6.89	7.67	7.31
#2	7.29	8.14	7.43	7.57	7.61
14. Scalloped Ham/Potatoes	8.14	8.71	8.00	7.71	8.14
15. Fish Provencal	7.75	7.13	8.00	6.50	7.35
16. Enchilada Casserole	8.25	8.13	7.88	8.00	8.07
17. Turkey Chili	8.13	8.00	8.25	7.86	8.06
18. Spicy Almond Chicken	7.00	7.75	8.00	7.86	7.53
19. Turkey Meat Loaf	7.00	7.00	7.11	7.00	7.03
20. Turkey Lasagna	8.33	7.83	7.50	8.00	7.92
21. Chicken Tarragon	8.00	7.63	7.29	8.00	7.93
22. Swedish MEatballs	7.50	7.50	7.75	7.75	7.63
23. Beef Stroganoff	7.25	8.13	6.86	8.13	7.59
24. Creamy Baked Fish	7.86	6.57	8.00	6.29	7.18

25.	Turkey Spaghetti	8.13	8.00	7.75	8.13	8.00
26.	Lemon BBQ Fish	7.88	7.50	7.63	7.25	7.57
27.	Chicken Valencia	6.88	7.25	7.00	6.88	7.00
	#2	7.33	7.17	7.00	6.50	7.00
28.	Chicken Pot Pie	7.13	5.88	6.63	5.75	6.35
	#2	7.50	7.25	6.88	6.25	6.97
29.	Marinated Broiled Fish	7.57	6.00	5.29	6.29	6.29
	#2	7.50	7.25	6.88	6.25	6.97
30.	Onion Topped Fish	7.63	5.00	6.13	6.38	6.29
31.	Burrito Pie	7.13	7.00	6.75	6.63	6.88
32.	Hot and Honeyed Chicken	8.33	8.00	8.00	7.67	8.00
33.	Tartar Sauced Fish	7.43	7.71	7.71	6.86	7.43
34.	Glazed Ham/Raisin Balls	7.29	7.29	7.57	7.43	7.40
35.	Crab Au Gratin	8.14	7.29	7.86	7.14	7.61
36.	Braised Fish	7.50	8.00	7.50	7.50	7.63
37.	Yogurt Sauced Chicken	7.00	8.00	7.50	7.33	7.46

BREAKFAST ENTREES

MENU ITEM	TASTE PANEL SCORES				
	APPEARANCE	FLAVOR	TEXTURE	AROMA	OVERALL
1. Handwarmer Hash	7.63	7.88	7.50	7.25	7.57
2. Tortilla Rollups	6.33	7.50	7.17	6.17	7.57
3. Potato Fritatta	7.57	7.57	7.43	7.71	7.57
4. Breakfast Tostados	8.56	8.11	8.11	7.44	8.16
5. Eggs Benedict	7.57	7.43	7.14	7.14	7.32
6. Mexican Scrambled Eggs	8.00	7.71	7.57	7.00	7.57
7. Cheesy Egg Sandwich	7.11	7.78	7.56	7.56	7.50
8. Grits and Ham Pie	8.00	8.11	7.33	7.44	7.22
9. Apple Egg Casserole	7.50	5.67	7.00	6.33	6.63
10. Omelet Sandwich	8.29	7.71	7.57	7.86	7.86
11. Ham and Eggs a la Swiss	7.43	8.33	7.86	7.71	7.83
12. Slender French Toast	7.86	7.43	7.43	7.14	7.47
13. Potato Scramble	7.67	7.17	7.50	6.50	7.21
14. Breakfast Pita Pockets	7.57	8.00	8.00	6.86	7.61
15. Chilies Rellenos Casserole	7.50	8.17	7.67	6.80	7.54
#2	8.17	7.17	7.50	7.00	7.46
16. Breakfast Casserole	8.00	8.17	8.50	8.17	8.21
17. Bedeviled Eggs	6.29	6.71	7.57	6.71	6.82
18. Angelled Eggs	6.29	7.43	7.29	6.17	6.80

OTHER ITEMS

MENU ITEM	TASTE PANEL SCORES				
	APPEARANCE	FLAVOR	TEXTURE	AROMA	OVERALL
1. Stuffed Potato	7.14	8.14	7.71	7.43	7.61
2. Corn Chowder	7.75	6.88	8.00	8.00	7.66
3. Southern Caviar (Black Eyed Pea Salad)	7.71	7.57	8.00	7.00	7.57
4. Light Potato Salad	7.57	8.14	7.29	6.57	7.39
5. Marinated Carrots	8.20	7.00	7.00	5.80	7.00
6. Turkey Waldorf Salad	7.43	7.29	7.86	6.71	7.32
7. Madras Salad	8.00	7.17	7.83	6.67	7.42
8. Oriental Rice	6.00	6.00	7.00	6.50	6.38
9. Fruit Filled Meringues	7.50	6.83	6.00	6.50	6.70
10. Light Seafood Gumbo	8.14	8.43	8.14	7.71	8.11
11. Chicken Spinach Salad	8.00	8.17	8.33	7.00	7.88
12. Beef/Spinach Pita Pockets	8.00	8.14	8.00	7.71	7.96
13. Italian Vegetable Bake	8.43	7.00	7.57	7.71	7.68
#2	8.17	8.00	8.00	7.50	7.92
14. Sweet and Sour Seashells	6.83	6.33	7.33	6.33	6.71

STUDENT ATHLETE RATINGS

MENU ITEM	NO.	SCORE
1. Chicken Divan Casserole	20	5.95
2. Spiced Mustard Fish	13	7.15
3. Fish Provencal	8	6.75
4. Enchilada Casserole	9	5.73
5. Turkey Chili	27	7.50
6. Spicy Almond Chicken	37	5.70
7. Chicken Tarragon	22	7.00
8. Beef Stroganoff	7	7.00
9. Light Potato Salad	8	6.13
10. Hot and Honeyed Chicken	13	7.92
11. Italian Meat Sandwich	34	7.41
12. Meat Loaf	26	8.03
13. Lemon BBQ Catfish	28	5.90
14. Hawaiian Ham	3	5.00
15. Stuffed Potato	32	7.06
16. Texas Chicken and Dumplings	16	6.31
17. Tartar Sauced Fish	7	7.14
18. Yogurt Sauced Chicken	20	6.75

08/03/90 ETNVRECL

ETNV DIETARY RECALL ANALYSIS (PROPERTY OF IDIF)

* STUDY 'MM01' CASE 'NM011' AVERAGE DAILY CONSUMPTION OF ALL FOODS DURING ALL MEALS

NUTRIENT	INTAKE	RDA	%RDA	NUTR:KCAL	NUTRIENT	INTAKE	RDA	%RDA	NUTR:KCAL	
KILOCALORIES	3158.	2900.0000	108.90		TOTAL CHO	331.5			41.9820	
MOISTURE	1781.8				TOTAL SUGARS	139.4			17.6501	
CHOLESTEROL	0.814			0.2319	TOTAL STARCH	151.4			19.1796	
ALCOHOL	0.1				KNOWN CHO NOT LISTED	0.0			0.0000	
CAFFEINE	0.103				UNKNOWN CHO	27.1			3.4280	
TOTAL PROTEIN	122.0	58.0000	210.30	15.4491	FIBER	5.3			1.6860	A
ANIMAL PROTEIN	88.1			11.1575	FRUCTOSE	10.8			1.3682	
VEGETABLE PROTEIN	31.3			3.9588	GLUCOSE	17.1			2.1698	
MIXED PROTEIN	0.0			0.0000	LACTOSE	27.7			3.5041	
UNKNOWN PROTEIN	0.0			0.0000	MALTOSE	0.3			0.0356	
TRYPTOPHAN	1.403			0.1777	SUCROSE NATURAL	83.3			10.5548	
LYSINE	8.047			1.0192	SUCROSE ADDED/USED	0.1			0.0096	
METHIONINE	2.715			0.3439	TOTAL SUCROSE	84.4			10.6927	
CYSTINE	1.607			0.2036	TOTAL DIETARY FIBER	2.4			0.7672	A
PHENYLALANINE	5.268			0.6672	INSOL DIETARY FIBER	9.7			3.0789	A
ISOLEUCINE	5.630			0.7131	PECTIC SUBSTANCES	2.38			0.3010	
LEUCINE	9.509			1.2044	VITAMIN A	29448.			9324.7361	B
TYROSINE	4.245			0.5377	RETINOL EQUIVALENT	5563.	1000.0000	556.28	1761.4511	C
THREONINE	4.847			0.6140	RETINOL	3.40891			1.0794	C
VALINE	6.193			0.7844	BETA CAROTENE	17.20386			5.4475	C
ARGININE	6.605			0.8365	VITAMIN D	1429.	400.0000	357.24	452.4724	B
HISTIDINE	3.224			0.4084	ALPHA TOCOPHEROL	0.03467	0.0100	346.66	10.9767	C
ALANINE	5.865			0.7429	THIAMINE	0.00943	0.0015	628.75	2.9864	C
ASPARTIC ACID	9.966			1.2622	RIBOFLAVIN	0.01051	0.0017	618.50	3.3294	C
GLUTAMIC ACID	21.969			2.7826	NIACIN, PREFORMED	0.0737	0.0190	387.68	23.3237	C
GLYCINE	5.241			0.6638	VITAMIN B6	0.00437	0.0020	218.71	1.3851	C
PROLINE	7.602			0.9629	VITAMIN B12	0.02056	0.0020	1027.82	6.5091	D
SERINE	5.655			0.7162	ASCORBIC ACID	0.225	0.0600	375.37	71.3150	C
TOTAL FAT	149.5			42.5961	PANTOTHENIC ACID	0.01790	.004-.007		5.6664	C
ANIMAL FAT	74.3			21.1784	TOTAL FOLACIN	0.2774	0.2000	138.68	87.8247	D
FISH FAT	0.0			0.0000	BIOTIN	0.0344	.030-.100		0.0109	D
VEGETABLE FAT	31.8			9.0665	VITAMIN K	0.03142	0.0700	44.88	0.0100	D
PART/FULLY HYDR FAT	29.4			8.3835	ASH	22.00				
UNKNOWN FAT	13.9			3.9561	CALCIUM	1.342	1.2000	111.87	425.0929	C
SFA	45.6			12.9952	PHOSPHORUS	1.880	1.2000	156.65	595.2454	C
USFA	84.6			24.1024	IRON	0.0372	0.0100	371.68	11.7691	C
UNKNOWN FATTY ACIDS	2.6			0.7415	SODIUM	4.328	0.5		1370.3822	C
MONOUNSAT FATTY ACIDS	61.9			17.6474	POTASSIUM	3.265	2.0		1033.9123	C
PALMITOLEIC ACID	0.7			0.2120	MAGNESIUM	0.309	0.3500	88.36	97.9286	C
TOTAL PUFA	27.4			7.7990	MANGANESE	0.00284	.002-.005		0.8977	C
MYRISTIC ACID	2.7			0.7658	ZINC	0.01924	0.0150	128.27	6.0925	C
PALMITIC ACID	27.6			7.8695	COPPER	1.14291	1.5-3.0		361.8979	D
STEARIC ACID	12.4			3.5348	COBALT	0.0530			16.7839	D
OTHER KNOWN SFA	1.1			0.3044	MOLYBDENUM	0.3744	.075-.25		118.5422	D
UNKNOWN SFA	1.8			0.5142	SELENIUM	0.1254	0.0700	179.20	39.7204	D
OLEIC ACID	58.0			16.5289	CHROMIUM	0.17871	0.05-0.20		56.5875	C
LINOLEIC ACID	25.0			7.1310	FLUORINE	0.627	1.5-4.0		198.6846	C
LINOLENIC ACID	1.6			0.4642	IODINE	0.31862	0.1500	212.42	100.8911	D
ARACHIDONIC ACID	0.2			0.0545	NON-HEME IRON	0.0221				
KNOWN NOT LISTED USFA	0.0			0.0000	HEME IRON	0.0028				
UNKNOWN USFA	3.9			1.1095						

*Menu Modification Project - Menu Not Modified

97

STARCH TO TOTAL SUCROSE RATIO	1.79370
PUFA TO SFA RATIO	0.60014
CALCIUM TO PHOSPHORUS	0.71415
NIACIN EQUIVALENT	0.91557

VITAMIN B12, RETINOL, BETA CAROTENE, TOTAL FOLACIN, BIOTIN, VITAMIN K, COPPER, COBALT, MOLYBDENUM, SELENIUM, CHROMIUM, FLUORINE, AND IODINE ARE EXPRESSED IN MILLIGRAMS; VITAMIN A AND VITAMIN D ARE EXPRESSED IN I.U.'S AND RETINOL EQUIVALENT IS EXPRESSED IN R.E.'S. ALL OTHER INTAKES ARE EXPRESSED IN GRAMS.

NUTRIENT TO CALORIE RATIO IS EXPRESSED AS A PERCENTAGE OF CALORIES FROM THE REFERENCED SOURCE EXCEPT WHERE INDICATED BY THE FOLLOWING CODES:

A - GRAMS PER 1000 KILOCALORIES
B - INTERNATIONAL UNITS PER 1000 KILOCALORIES
C - MILLIGRAMS PER 1000 KILOCALORIES
D - MICROGRAMS PER 1000 KILOCALORIES

RDA GIVEN FOR MALE, 19 THROUGH 24 YEARS OLD.

*Menu Modification Project - Menu Not Modified

ETNV DIETARY RECALL ANALYSIS (PROPERTY OF IDII')

* STUDY 'MM01' CASE 'MM011' AVERAGE DAILY CONSUMPTION OF ALL FOODS DURING ALL MEALS

NUTRIENT	INTAKE	RDA	%RDA	NUTR:KCAL	NUTRIENT	INTAKE	RDA	%RDA	NUTR:KCAL	
KILOCALORIES	2759.	2900.0000	95.15		TOTAL CHO	305.6			44.3021	
MOISTURE	1942.8				TOTAL SUGARS	124.2			18.0106	
CHOLESTEROL	0.450			0.1467	TOTAL STARCH	140.4			20.3584	
ALCOHOL	0.1				KNOWN CHO NOT LISTED	0.0			0.0000	
CAFFEINE	0.103				UNKNOWN CHO	27.6			4.0011	
TOTAL PROTEIN	117.8	58.0000	203.10	17.0763	FIBER	5.5			2.0050	A
ANIMAL PROTEIN	88.0			12.7542	FRUCTOSE	11.0			1.5880	
VEGETABLE PROTEIN	29.6			4.2940	GLUCOSE	16.9			2.4505	
MIXED PROTEIN	0.0			0.0000	LACTOSE	30.4			4.4093	
UNKNOWN PROTEIN	0.0			0.0000	MALTOSE	0.2			0.0298	
TRYPTOPHAN	0.945			0.1370	SUCROSE NATURAL	65.2			9.4502	
LYSINE	4.980			0.7219	SUCROSE ADDED/USED	0.0			0.0000	
METHIONINE	1.683			0.2440	TOTAL SUCROSE	66.2			9.5981	
CYSTINE	0.959			0.1390	TOTAL DIETARY FIBER	2.6			0.9334	A
PHENYLALANINE	3.624			0.5253	INSOL DIETARY FIBER	10.2			3.6823	A
ISOLEUCINE	3.879			0.5623	PECTIC SUBSTANCES	2.43			0.3522	
LEUCINE	6.406			0.9286	VITAMIN A	29272.			10608.3106	B
TYROSINE	2.966			0.4300	RETINOL EQUIVALENT	5507.	1000.0000	550.72	1995.8525	C
THREONINE	3.049			0.4420	RETINOL	3.49121			1.2653	C
VALINE	4.272			0.6192	BETA CAROTENE	17.52705			6.3520	C
ARGININE	3.869			0.5609	VITAMIN D	1451.	400.0000	362.73	525.8190	B
HISTIDINE	2.002			0.2902	ALPHA TOCOPHEROL	0.03387	0.0100	338.70	12.2747	C
ALANINE	3.238			0.4693	THIAMINE	0.00919	0.0015	612.40	3.3291	C
ASPARTIC ACID	6.247			0.9055	RIBOFLAVIN	0.00998	0.0017	587.23	3.6179	C
GLUTAMIC ACID	16.446			2.3840	NIACIN, PREFORMED	0.0733	0.0190	385.92	26.5733	C
GLYCINE	2.816			0.4083	VITAMIN B6	0.00381	0.0020	190.36	1.3798	C
PROLINE	6.236			0.9039	VITAMIN B12	0.01603	0.0020	801.56	5.8099	D
SERINE	3.884			0.5630	ASCORBIC ACID	0.230	0.0600	382.90	83.2594	C
TOTAL FAT	119.6			38.9966	PANTOTHENIC ACID	0.01653	.004-.007		5.9920	C
ANIMAL FAT	55.3			18.0408	TOTAL FOLACIN	0.2303	0.2000	115.15	83.4641	D
FISH FAT	4.7			1.5429	BIOTIN	0.0373	.030-.100		0.0135	D
VEGETABLE FAT	29.6			9.6607	VITAMIN K	0.00437	0.0700	6.24	0.0016	D
PART/FULLY HYDR FAT	26.6			8.6686	ASH	23.46				
UNKNOWN FAT	3.8			1.2270	CALCIUM	1.631	1.2000	135.95	591.2429	C
SFA	36.9			12.0387	PHOSPHORUS	1.959	1.2000	163.26	709.9942	C
USFA	72.0			23.4839	IRON	0.0334	0.0100	334.32	12.1162	C
UNKNOWN FATTY ACIDS	3.8			1.2392	SODIUM	4.444	0.5		1610.3819	C
MONOUNSAT FATTY ACIDS	44.3			14.4432	POTASSIUM	3.690	2.0		1337.1613	C
PALMITOLEIC ACID	0.9			0.3061	MAGNESIUM	0.291	0.3500	83.18	105.5031	C
TOTAL PUFA	25.4			8.2775	MANGANESE	0.00278	.002-.005		1.0060	C
MYRISTIC ACID	2.6			0.8449	ZINC	0.01021	0.0150	68.08	3.7009	C
PALMITIC ACID	18.9			6.1584	COPPER	0.97806	1.5-3.0		354.4595	D
STEARIC ACID	8.6			2.8123	COBALT	0.0496			17.9613	D
OTHER KNOWN SFA	2.0			0.6672	MOLYBDENUM	0.3622	.075-.25		131.2478	D
UNKNOWN SFA	2.6			0.8441	SELENIUM	0.0966	0.0700	137.98	35.0043	D
OLEIC ACID	40.6			13.2449	CHROMIUM	0.16467	0.05-0.20		59.6760	C
LINOLEIC ACID	23.4			7.6455	FLUORINE	0.554	1.5-4.0		200.7674	C
LINOLENIC ACID	1.2			0.4049	IODINE	0.36179	0.1500	241.19	131.1151	D
ARACHIDONIC ACID	0.0			0.0000	NON-HEME IRON	0.0205				
KNOWN NOT LISTED USFA	0.0			0.0000	HEME IRON	0.0019				
UNKNOWN USFA	3.0			0.9793						

*Menu Modification Project - Modified Menu

ETNV DIETARY RECALL ANALYSIS (PROPERTY OF IDIF)

STARCH TO TOTAL SUCROSE RATIO	2.12108
PUFA TO SFA RATIO	0.68757
CALCIUM TO PHOSPHORUS	0.83274
NIACIN EQUIVALENT	0.64049

VITAMIN B12, RETINOL, BETA CAROTENE, TOTAL FOLACIN, BIOTIN, VITAMIN K, COPPER, COBALT, MOLYBDENUM, SELENIUM, CHROMIUM, FLUORINE, AND IODINE ARE EXPRESSED IN MILLIGRAMS; VITAMIN A AND VITAMIN D ARE EXPRESSED IN I.U.'S AND RETINOL EQUIVALENT IS EXPRESSED IN R.E.'S. ALL OTHER INTAKES ARE EXPRESSED IN GRAMS.

NUTRIENT TO CALORIE RATIO IS EXPRESSED AS A PERCENTAGE OF CALORIES FROM THE REFERENCED SOURCE EXCEPT WHERE INDICATED BY THE FOLLOWING CODES:

A - GRAMS PER 1000 KILOCALORIES
B - INTERNATIONAL UNITS PER 1000 KILOCALORIES
C - MILLIGRAMS PER 1000 KILOCALORIES
D - MICROGRAMS PER 1000 KILOCALORIES

RDA GIVEN FOR MALE, 19 THROUGH 24 YEARS OLD.

*Menu Modification Project - Modified Menu